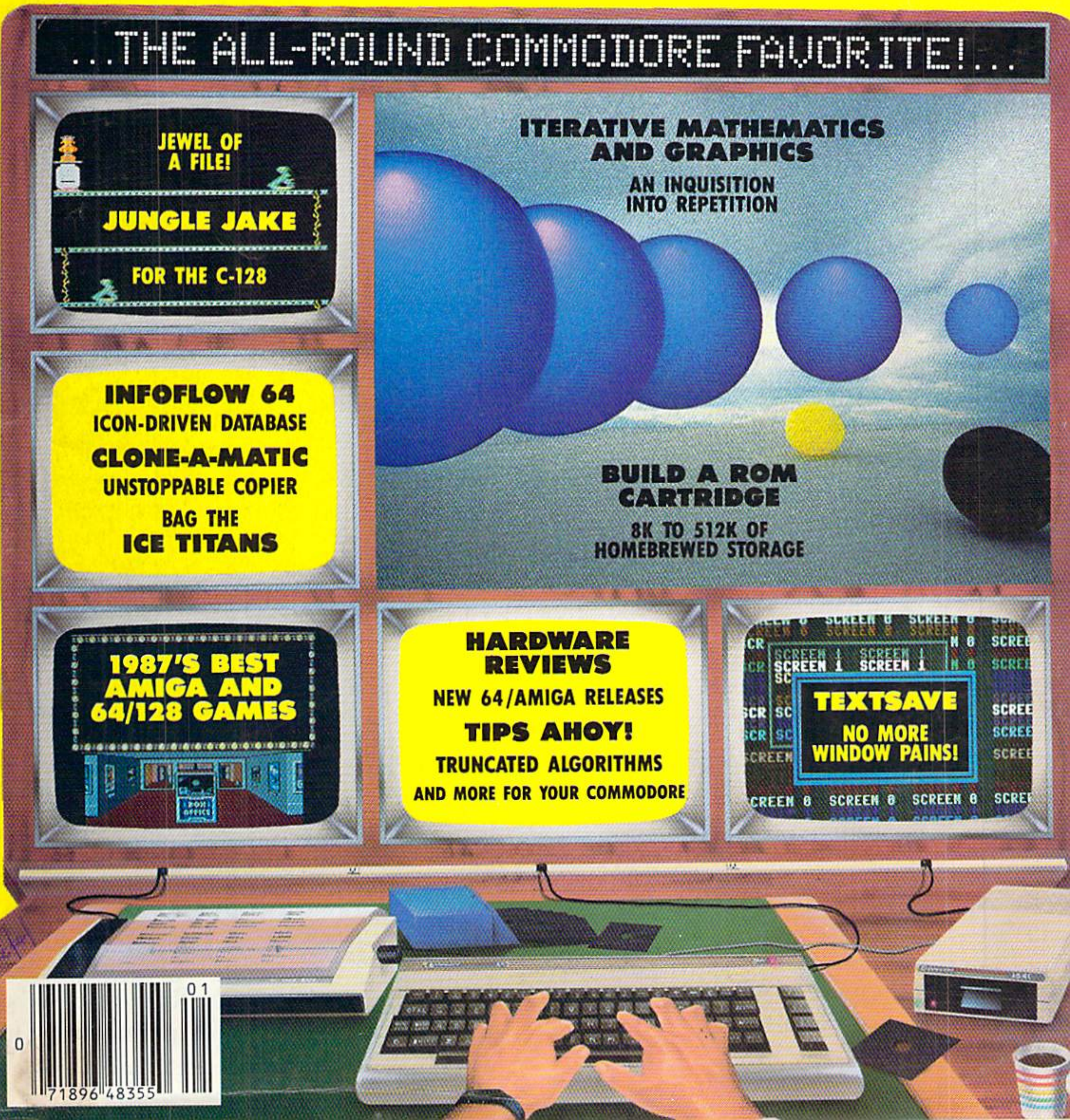
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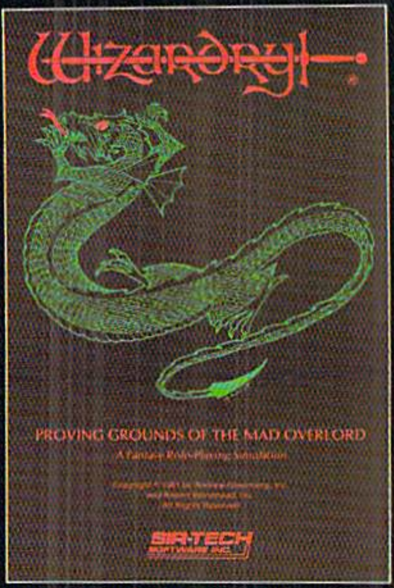
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Cover art by James Regan; photography by COMSTOCK and Michael R. Davila

ISSUE NO. 49 JANUARY 1988

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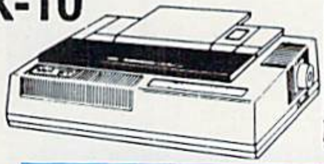
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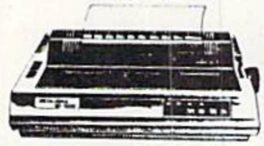
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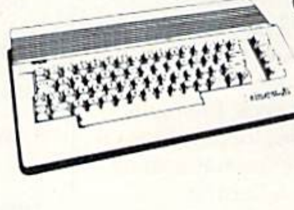
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VIEW FROM THE BRIDGE

High school only lasts for four years. So does the reign of an Olympic champion. And the term of a US President. (Forget about reelection—it spoils our analogy.) But *Ahoy!* has been around four years as of this month, and is still going strong! It was January 1984 when our first issue hit the stands, bearing the provocative headline: "Can the 64 Crack the Peanut?" It did—along with every other home computer made—which is why we're still here to tell about it one leap year later. Commodore's strong upward surge of late, courtesy of the Amiga 500's success, makes us confident that this won't be the last January we and our readers celebrate together.

Further cause for celebration is the fact that *Ahoy!'s* editorial staff is once again at full strength. Ace programmer Cleve Blakemore has relocated to the Big Apple from Richmond, Virginia to fill the position vacated by Tim Little. Those of you familiar with Cleve's work know that we couldn't have asked for a human being better qualified for the job. In months to come you'll see more programs from Cleve than ever before. He managed three this month—and that's without looking at the keyboard! (His neck hurt too much from staring at tall buildings.)

Equally worthy of gawking at are the contents of the January *Ahoy!:*

• *Infoflow*, the icon-driven database (April '87), was an impressive programming achievement even for BASIC 7.0. Imagine our excitement when Cleve told us he could convert it for the 64, sacrificing nothing but the 128's greater memory capacity. (Turn to page 70.)

• More than just an ape of *Donkey Kong* and other chutes and ladders games, *Jungle Jake* pits your safari-helmeted hero against such varied foes as snakes, parrots, Zulu warriors, and monkeys on seven colorful C-128 screens. (Turn to page 16.)

• We were ready to put on parkas just watching Cleve program *Ice Titans*, in which a crash-landed explorer must fight his way past the deadly denizens of a world of eternal frost. (Turn to page 18.)

• In four years of writing the column that bears his name, Dale Rupert has managed never to repeat himself. This month is as close as he'll ever come to repetition, as he deals with the *Repetitive Processes* of mathematical and graphics iteration. (Turn to page 32.)

• It's rare that a first-time contributor comes up with a utility as good as Richard Curcio's *TextSave*. The program enables the 128 user to open and close up to five windows, restoring the text below. (Turn to page 20.)

• As editor of *Electronic Games* magazine, Arnie Katz and his staff would annually award the Arkies to the best videogames of the preceding year. The tradition lives on, as for the third year in a row Arnie and the editors of *Ahoy!* select the best in Commodore entertainment software, both for the 64/128 (turn to page 41) and the Amiga (turn to page 53).

• Morton the K continues to chart *The Ins and Outs of the C-64/128 Expansion Port* with a guide to building your own ROM cartridge of up to 512K. (Turn to page 59.)

• When Morton gets into hardware mode, he's tough to turn off. Also in this issue, he reviews the A20 hard disk drive for the Amiga (turn to page 54) and the Hotshot Plus printer interface for the C-64 family (turn to page 66). On the soft side, he supplies a detailed look at Firebird's *Advanced OCP Art Studio* (turn to page 63).

• New computerists in search of an all-purpose copy utility need look no further than Buck Childress's *Clone-a-Matic*. It will copy program, sequential, and user files, in machine language or BASIC, quickly and easily. (Turn to page 30.)

• Most of you don't need to be reminded of all the regular columns well worth a look: *Scuttlebutt*, surveying the field of coming Commodore products (turn to page 8); *Tips Ahoy!*, packing in some of the most valuable short routines you'll find in print (turn to page 46); and *Commodares*, putting programmers of all levels to the test (turn to page 75).

Whether you've been with us four years or four months, we thank you for your patronage. We can imagine no greater privilege than bringing the serious Commodore users of the world the best package of programs, articles, news, and reviews we know how. When we fail in our duty, as we sometimes do, we count on you to let us know—and you always have. Please keep it up. We want to get glassy-eyed all over again in January 1989! *—David Allikas*

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English & Scottish Songs—II continues Free Spirit's collection of 17th century British folk music with "Blue Bells of Scotland," "Annie Laurie," "The Keel Row," and 17 others. As each song plays, its lyrics and historical background appear onscreen. Price is $9.95, or $17.95 for Volumes I and II.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 12).

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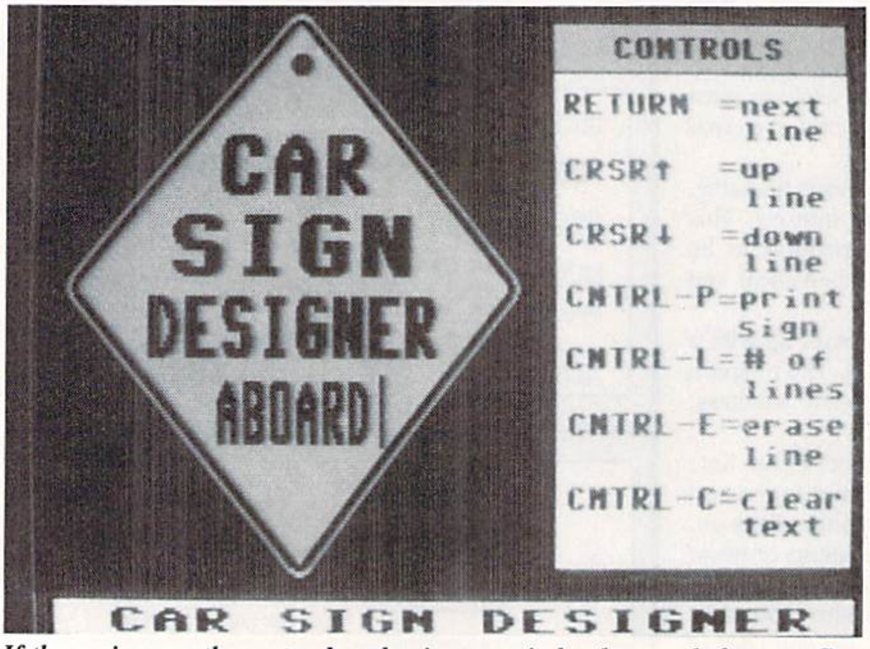
Quick, before those diamond-shaped yellow car signs catch on—*Car Sign Designer* ($29.95) will allow you to create your own. Included are two reusable plastic sign holders with suction cups, a stack of bright yellow fanfold paper, and a C-64 program for designing your sign onscreen. Up to four lines of text can be entered, with characters automatically centered and the width of the bold typeface automatically adjusted as characters are added.

Zebra Systems, Inc., 718-296-2385 (see address list, page 12).

C-128 STOCK ANALYSIS

Securities Analyst-128 ($49.95) takes advantage of the 128's two video chips by displaying all text information on the 80 column monitor while displaying charts and graphs on the 40 column monitor. The marketeer enters data from the newspaper or other sources, from which the program will prepare charts on weekly performance, moving average, accumulation/distribution, trailing stops, and point and figure. Analysis includes P/E ratios, coefficient of variability, beta factors, and gains percentage. Also on the program disk is a mini-word processor for keeping notes, and data on the performance of 16 stocks.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 12).



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New 32K ($99) and 64K ($129) versions of the *Quick Brown Box* battery-backed RAM cartridge for the 64 permit storage of up to 30 programs or utilities, providing access to even the longest program in under one second. Loader software is included.

Brown Boxes, Inc., 617-275-0090 (see address list, page 12).

BOOKS

The Viewport Technician covers the design, development, and coding of software that can be ported among the Amiga, Atari ST, IBM PC, Macintosh, and Apple IIGS. The computers and their windowing environments are technically compared. 496 pages; $24.95.

Scott, Foresman and Company, 312-729-3000 (see address list, page 12).

The following three from TAB:

The Commodore Programmer's Challenge consists of 50 problems, grouped for beginning, intermediate, and expert programmers. Solutions are written in BASIC, Pascal, and C. 240 pages; $14.95.

Computer Architecture and Communications offers an overview for advanced beginners, covering processors, memory, machine codes, networks, and more. 288 pages; $16.95.

TAB Books, Inc., 717-794-2191 (see address list, page 12).

HARD DISK BACKUP

For use with all AmigaDOS-compatible hard disk drives, *Quarterback* ($69.95) transfers 20 megabytes to floppy format in 45 minutes. Full/subdirectory/incremental backup and restore are supported, with automatic diskette formatting, file cataloging, and disk-

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ette sequence numbering and checking.

Central Coast Software, 805-528-4906 (see address list, page 12).

AMIGA WP

Precisely ($79.95), an Amiga word processor, features a non-technical user interface designed for Amiga users with little computer experience. The program can print selected screen areas, such as an address for an envelope. Supported features include multitasking, multiple windows, keyboard macros, online help, and column cut and paste.

Central Coast Software, 805-528-4906 (see address list, page 12).

WE ARE THE FORMS

The 1987 version of *Taxaid* reflects all tax law changes for tax year 1987. The program will prepare IRS Form 1040, Schedules A-E, and Form 2441 (Child Care). All calculations are automatic. For the C-64 and Plus/4; $44.95.

Taxaid Software, Inc., 218-834-5012 (see address list, page 12).

AMIGA SOUND SAMPLER

The *AudioMaster* sampling and editing program ($59.95) lets Amiga musicians manipulate and digitally sample sound, mix sounds together, alter their waveform, and save them as instruments to be used in other Amiga music programs. The program works with any digital sound sampling hardware for the Amiga 500, 1000, or 2000. Sample lengths vary with memory available: 512K allows up to two minutes, and 8 megabytes as much as five minutes.

Aegis Development Inc., 213-392-9972 (see address list, page 12).

SATELLITE DISK

SATCOMM-64 ($15.95) allows amateur radio operators who communicate via satellite-based transponders and BBS-like systems to track the satellites, determining access times and antenna placement. Information can be stored for 15 different satellites; entry of a time bracket can produce a printed report of up to 31 days of access times. C-64 users who are not radio operators can use the program to track easily visible satellites like the Salyut-7, MIR, and Cosmos 1870.

Strategic Marketing Resources, Inc., 314-256-7814 (see address list, page 12).

RE-ACCOUNTING

Version 2.0 of *The Accountant* for the 128 features a disk file utility for rebuilding most corrupted files, a Payroll section expanded to handle 100 employees, individualized state withholding tax rates, and a third percentage deduction. The new version will not run on the 1541 disk drive.

KFS Software, Inc. (see address list, page 12).

TERMINAL SOFTWARE

The Communicator ($39.95), a C-64 terminal program, offers a choice of nine baud rates from 50 to 1800, plus user-defined rates. A buffer of 18,686 characters is supported, along with full printer, disk, modem, and status line support. Disk files can be sent to received with or without X-modem pro-

tocols; macro key options are provided for fast transmission of frequently used commands. Video attribute options include border, background, character, cursor color, 40/64/80 column display, cursor definition, and user-defined character sets.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 12).

AMIGA POWER SUPPLY

The CPS-500 replacement power supply ($99.95) offers Amiga 500 owners three auxiliary 117 VAC sockets with transient/spike suppression, EMI and EPI filtering, and short circuit and current limit protection. Other features are a user-serviceable all-metal chassis, six foot power cord, and remote 5V D.C. sensing.

Phoenix Electronics, Inc., 913-632-2159 (see address list, page 12).

ELECTRONIC MUSIC

Following *It's Only Rock 'N Roll* in EA's collection of music library disks for use with an Amiga and *Instant Music, DeluxeVideo,* and *Deluxe Music Construction Set, Hot & Cool Jazz* ($29.95) contains over 40 tunes ranging from ragtime to modern fusion. Studio-recorded, digitized instruments are available for composing.

Electronic Arts, 415-571-7171 (see address list, page 12).

TRY TO REMEMBER

Two C-64 memory improvement programs from Sunburst, each $65:

Simon Says requires kindergarteners to grownups to repeat an onscreen sequence of colors, numbers, or letters. The chain lengthens until the student misses an item. Up to four may play in competition.

Teddy and Iggy lets kindergarteners to second graders stack brightly colored shapes and open boxes, memorizing the sequence in which the tasks are performed.

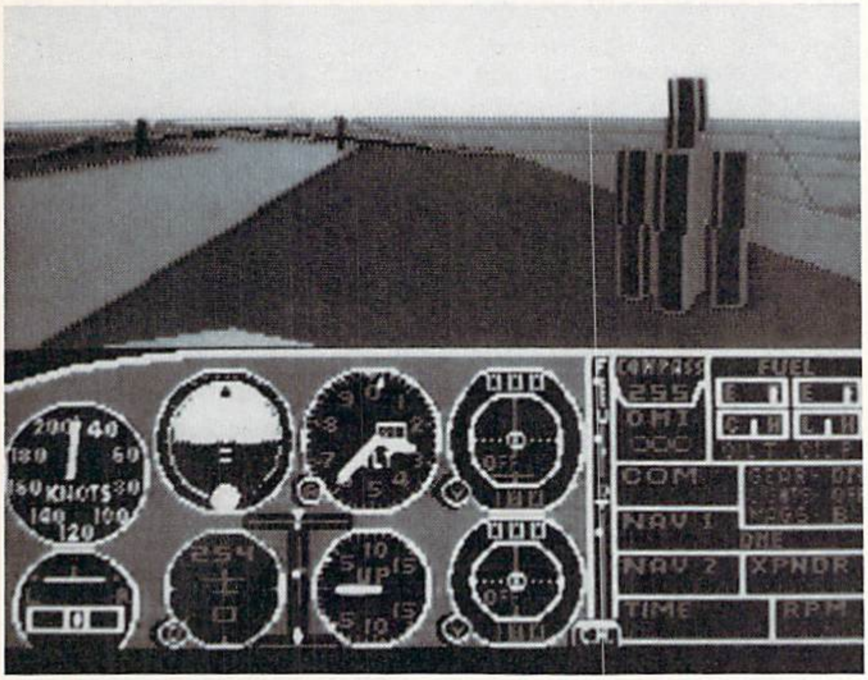
Sunburst Communications, Inc., 800-431-1934 or 914-769-5030 (see address list, page 12).

GAMES

One or two players must use missiles to defend their *Outpost* ($19.95) from an onslaught of enemy laser powered bombs, sweepers, and shield bombs. The joystick- or trackball-controlled game for the 64 offers four levels of difficulty.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 12).

Scenery Disk #11 ($24.95), for use with *Flight Simulator II* or *Jet* on the



Scenery Disk #11 *for SubLOGIC's flight simulators depicts the Detroit, Pittsburgh, and Niagara Falls areas.* *READER SERVICE NO. 286*

C-64, covers the Great Lakes area, with detailed views of Detroit, Pittsburgh, and Niagara Falls. A new default ground pattern simulates fields and other areas of varying color on the earth below.

SubLOGIC Corporation, 217-359-8482 (see address list below).

Firebird has launched its Mid-Range line with *Druid, Revs Plus, Cholo, Heartland, Silicon Dreams,* and *Jewels of Darkness* for the 64 ($24.95 each), plus the latter two for the Amiga as well ($29.95 each).

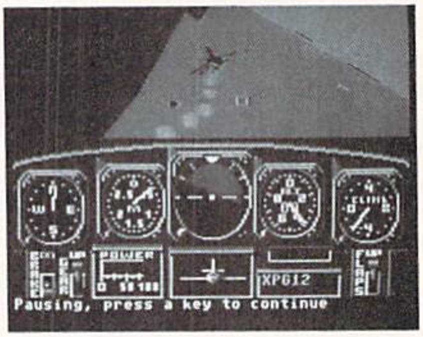
Firebird, 201-444-5700 (see address list below).

From Electronic Arts:

The new EA-distributed Amiga version of *Quizam* ($34.95) contains over 2000 questions in the categories of Popular Culture, TV, Music, Movies, History, Art, Geography, and Literature, plus a question-making program.

The C-64 adaptation of *Chuck Yeager's Advanced Flight Trainer* ($34.95) allows flight simulation fans to test and fly formation with real and experimental aircraft. A fast frame rate lets the player experience the feeling of mach-speed flight. Included are three levels of onscreen instruction from General Yeager: the first for basic flying skills, the second for advanced maneuvers, and the third for acrobatic stunts.

Halls of Montezuma ($39.95) traces the battle history of the United States



Advanced Flight Trainer: ***mach speeds.***
READER SERVICE NO. 287



AFT ***co-designer Chuck Yeager offers three levels of onscreen instruction.***

Companies Mentioned in Scuttlebutt

ActionSoft
201 W. Springfield Ave.
Champaign, IL 61820
Phone: 217-398-8388

Activision, Inc.
2350 Bayshore Parkway
Mountain View, CA 94043
Phone: 415-960-0410

Aegis Development, Inc.
2210 Wilshire Blvd. #277
Santa Monica, CA 90403
Phone: 213-392-9972

Brown Boxes, Inc.
26 Concord Road
Bedford, MA 01730
Phone: 617-275-0090

Central Coast Software
268 Bowie Drive
Los Osos, CA 93402
Phone: 805-528-4906

Electronic Arts
1820 Gateway Drive
San Mateo, CA 94404
Phone: 415-571-7171

Firebird
71 North Franklin Tpke.
Waldwick, NJ 07463
Phone: 201-444-5700

Free Spirit Software
538 S. Edgewood
LaGrange, IL 60525
Phone: 312-352-7323

KFS Software, Inc.
P.O. Box 107
1301 Seminole Blvd., Suite 117
Largo, FL 34649-0107

ReadySoft Inc.
P.O. Box 1222
Lewiston, NY 14092
Phone: 416-731-4175

Phoenix Electronics, Inc.
P.O. Box 156
Clay Center, KS 67432
Phone: 913-632-2159

Scott, Foresman and Co.
1900 East Lake Avenue
Glenview, IL 60025
Phone: 312-729-3000

Strategic Marketing Resources, Inc.
P.O. Box 2183
Ellisville, MO 63011
Phone: 314-256-7814

SubLOGIC Corporation
713 Edgebrook Drive
Champaign, IL 61820
Phone: 217-359-8482

Sunburst
Pleasantville, NY 10570
Phone: 800-431-1934 or 914-769-5030

TAB Books, Inc.
Blue Ridge Summit, PA 17214
Phone: 717-794-2191

Taxaid Software Inc.
606 Second Avenue
Two Harbors, MN 55616
Phone: 218-834-5012

Ultrabyte, Inc.
P.O. Box 789
La Canada, CA 91011
Phone: 818-796-0576

Zebra Systems, Inc.
78-06 Jamaica Avenue
Woodhaven, NY 11421
Phone: 718-296-2385



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Marine Corps, from the Mexican War to Vietnam. As Corporate Commander you lead your forces into eight preprogrammed battle scenarios, or into ones of your own design.

For the 64 from the Datasoft subsidiary of Electronic Arts:

Bismarck: The North Sea Chase ($29.95) simulates the 1941 battle between the German battleship and the British Hood. As commander of either vessel, you track your naval units with the help of a main screen map. At the same time factors like weather, time of day, and presence of mine fields and ice floes must be considered.

Force 7 ($19.95) rockets you into the future where you must rescue earthlings held hostage on the planet Karis. Each of your seven crew members has unique qualifications that can aid you in your assignment.

Electronic Arts, 415-571-7171 (see address list, page 12).

ThunderChopper ($29.95) puts the player in control of a Hughes 530MG Defender, offering the latest in weaponry and tracking systems. 3D graphics supplied by SubLOGIC offer detailed out-the-window views in day, dusk, and night flight modes.

ActionSoft, 217-398-8388 (see address list, page 12).

NEW NIBBLER

Ultrabyte has announced Version 4.0 of their *Disk Nibbler*, which will copy most commercial software in under two minutes. One or two 1541 or 1571 drives can be used. Price is $39.95 plus $4.00 shipping.

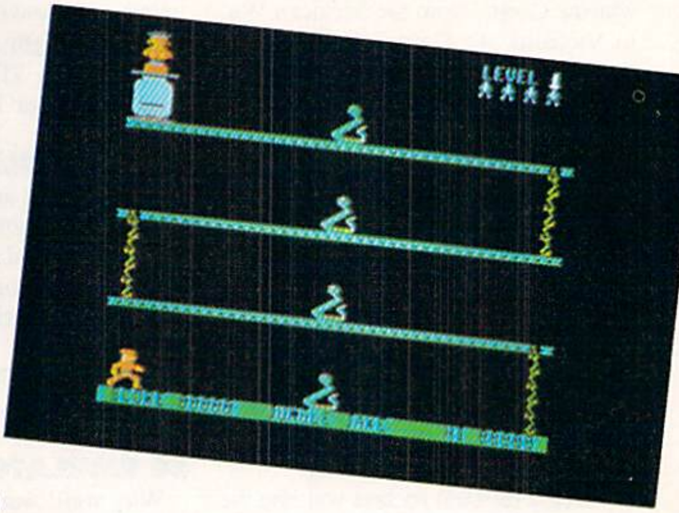
Ultrabyte, 818-796-0576 (see address list, page 12).

64 EMULATOR

Why you'd want to is another issue entirely. But *The 64 Emulator* from ReadySoft will turn your Amiga into a Commodore 64, with all video modes including sprites and raster interrupts, plus sound and color, fully supported. The program also supports all Amiga disk drives and printers; with an optional interface cable, any C-64 disk drive or printer can be connected directly to your Amiga.

ReadySoft Inc., 416-731-4175 (see address list, page 12).





For the C-128

By Cleveland M. Blakemore

Jungle Jake is an arcade-style game for the C-128 similar to *Donkey Kong* and other multilevel challenges.

This is definitely a program worth having if you own a C-128. You'll be amazed that so much game could be packed into so little code. There are seven colorful screens of challenging play, accompanied by a variety of musical scores and hyper-nervous joystick action. You may play this one for a long time before you make it to screen 7.

The program uses the joystick in Port 2 to control Jake, a safari explorer with the power to make Olympic-quality high jumps over obstacles. His mission is to save Clarinda from the Zulus who have captured her and are boiling her for dinner in the upper left hand corner of the screen.

Move Jake left or right to get to the vines at the end of each platform, so he can climb up to the next canopy. To leap over the many predators Jake will encounter during his adventure, push the fire button.

Jake's jump has a certain amount of "float" to it, meaning he can change direction in mid-jump or even leap backwards. You'll need to get a feel for it before you can successfully get past the critters on each level.

To save Clarinda, leap to the edge of the pot she is in and touch her, avoiding the smoking coals beneath. The lovers will be temporarily reunited, but Clarinda will vanish from Jake's arms afterwards to appear on the next level.

As you make your way through the jungle, you'll find yourself plagued by snakes, parrots, Zulu warriors, and monkeys, all of them skittish and unnervingly unpredictable. If any of them catches Jake, he will lose one of the four lives displayed at the upper right hand corner.

The current score and high score are displayed on the bar at the bottom of the screen. For each platform you surmount, you'll receive a 100*level point increase. Each completed level is worth 1000*level points. The current level is also in the upper right hand corner.

I have only made it to the seventh level three times, and I've played the game several hundred times. Any score over 5000 is good. *Jungle Jake* is a very tough game indeed, even if you're a veteran joystick jockey.

The seven screens each have individual names:

1) BITE IN THE ASP
2) FOR THE BIRDS
3) ZULU COUNTRY
4) MONKEY BUSINESS
5) SNAKE YOUR BODY
6) PECKERS FROM ABOVE
7) HEADSHRINKER HEAVEN!

There is a special score of music for those rare players who make it to the seventh level, along with a congratulatory message. □***SEE PROGRAM LISTING ON PAGE 84***

PHOTOS: MICHAEL R. DAVILA

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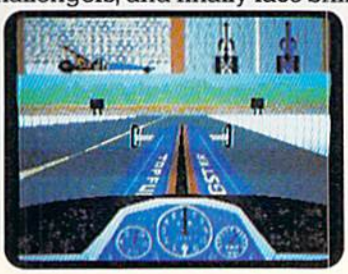


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— Shirley Muldowney

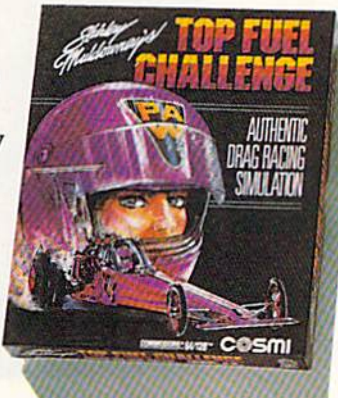
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Don't red-light, smoke your tires, or blow your engine. You'll need the points and prize money…it's a long season.



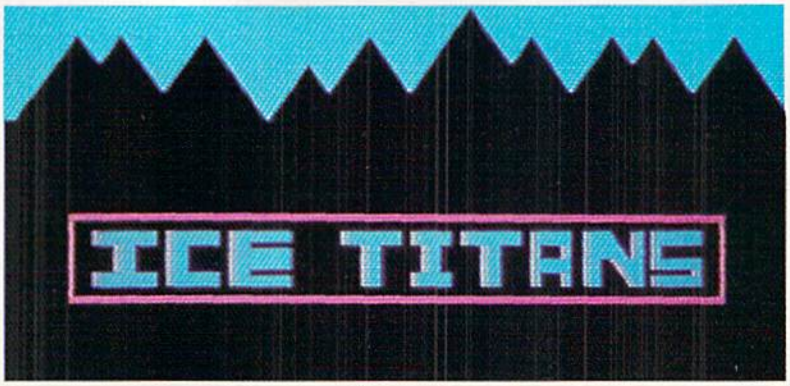
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Reader Service No. 282



For the C-64

By Cleveland M. Blakemore

Your shuttlecraft has crash-landed on the surface of a harsh and forbidding world—a planet of eternal frost and snow. Although you've managed to drag what remains of your equipment into a small underground cavern, your troubles are not over yet. You will have to fight for your very existence against the *Ice Titans,* the deadly inhabitants of this misty, shrouded landscape.

Ice Titans is a one-player game using a joystick plugged into Port 2. The joystick controls two separate laser cannons: one that moves horizontally, the other vertically. The joystick moves either ship along its axis in both the X and Y planes. The fire button launches photon blasts from the guns.

The objective is to destroy the horde of fierce aliens rushing in through the mouth of the ice cave before they destroy you.

The guns are independent. Each one can take a maximum of three blasts from an alien before it will explode. The remaining energy level of the laser cannon is indicated by its color. When it's light gray, it is undamaged. If it's medium gray, it has sustained one hit. If it is dark gray, it is within one more hit of being destroyed. You can continue to fight on with either remaining gun as long as you can hold out.

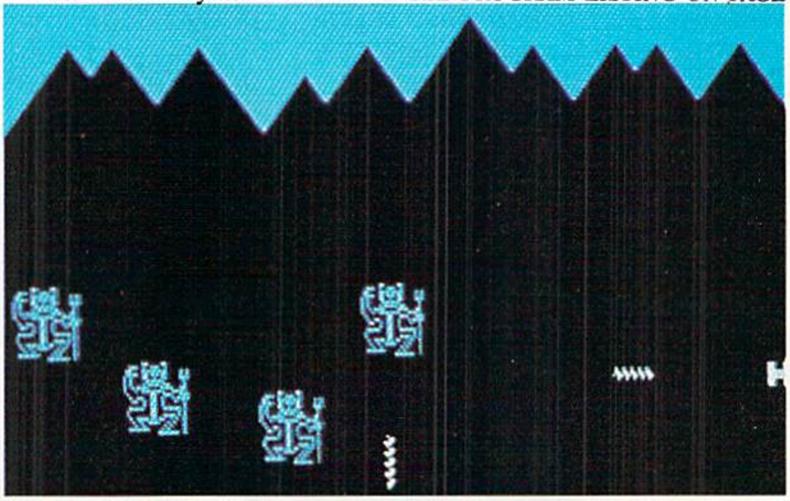
With each new level, the aliens get faster and more numerous, until the horrid ninth level, when they really go haywire. The flashing block between the current score and high score at the bottom of the screen indicates which level you are on.

The aliens are each worth 10 points multiplied by the current level. Each time you complete a level, a fanfare sounds and you are awarded a bonus of 1000 points.

Any score over 6000 is terrific. It's hard to last very long after the seventh level, when the aliens really start to boogie.

Ice Titans is 100% machine language, so you'll need *Flankspeed* (see page 83) to enter it. When you have saved a copy to disk, load the program with LOAD"ICE TITANS",8,1 and type SYS 49152 when the cursor appears. ☐

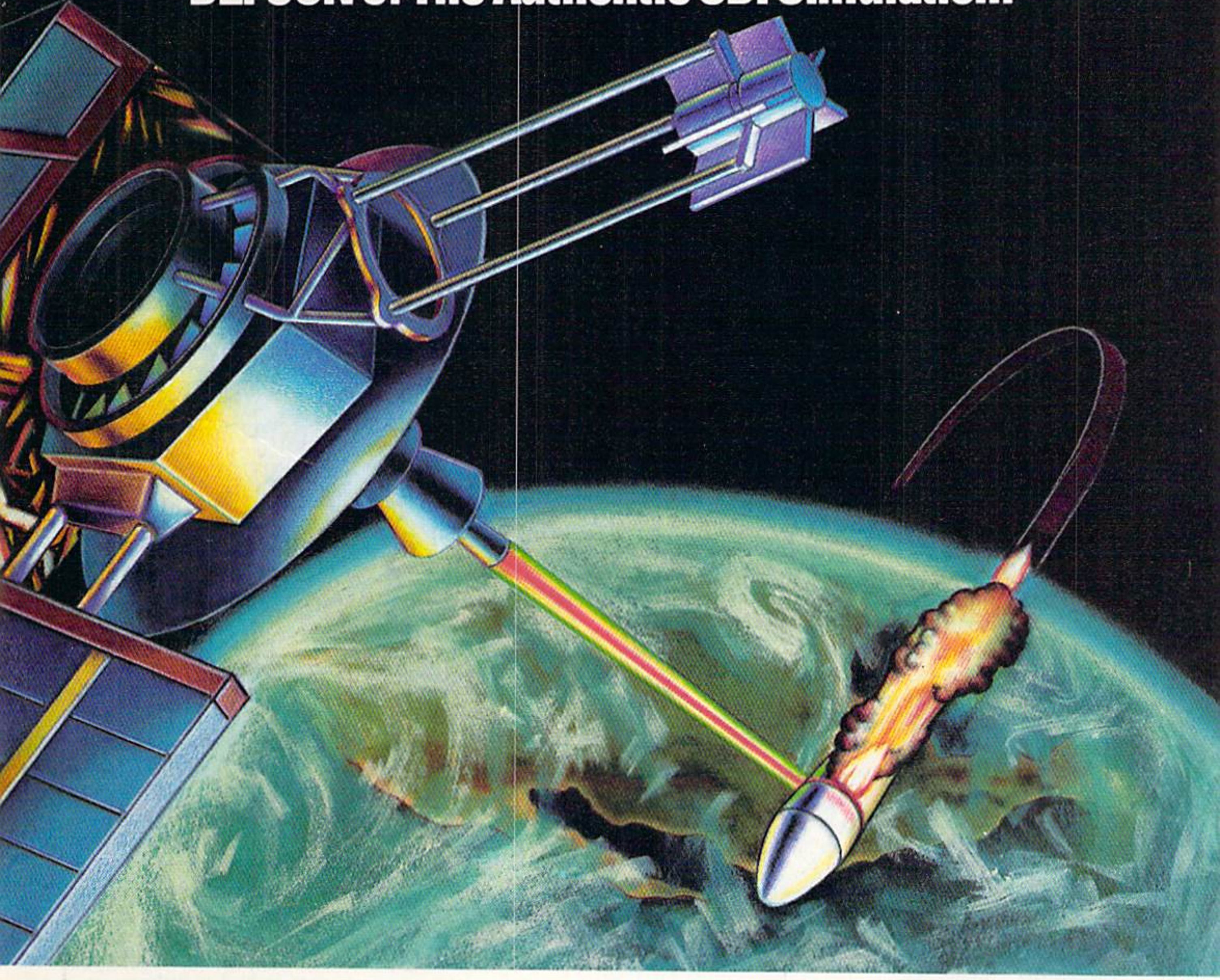
SEE PROGRAM LISTING ON PAGE 89



PHOTOS: MICHAEL R. DAVILA

SAVING THE HUMAN RACE CAN BE VERY ENTERTAINING.

DEFCON 5: The Authentic SDI Simulation.

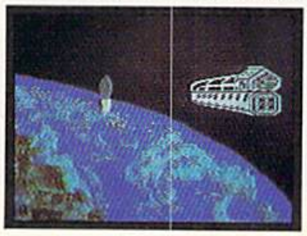


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TEXTSAVE

Window Recovery for the C-128

By Richard Curcio

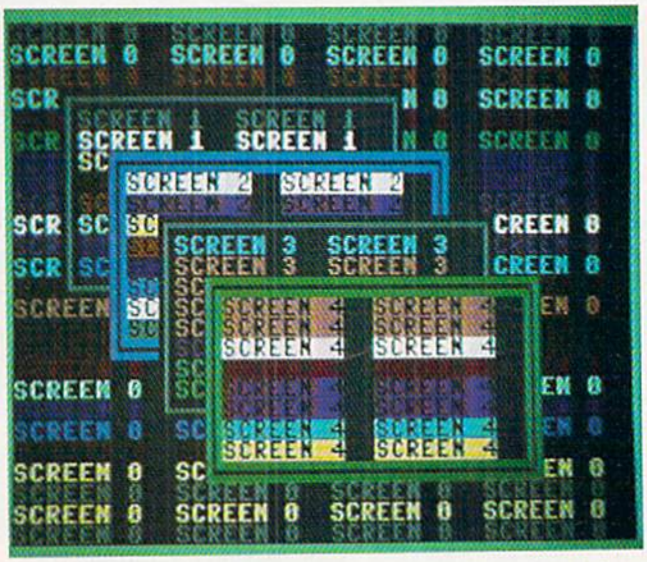
The C-128 40-column display has a number of enhancements over its C-64 counterpart, the most significant being the BASIC 7.0 WINDOW statement. A major shortcoming of this feature is that once a window has been opened, whatever was under it is lost. The utility presented here can store and recall up to five 40-column text screens, including character colors and editor values, enabling a BASIC program to open and close multiple windows, each time restoring the preceding display. The routine has other uses as well.

THE PROGRAM

Type in *TextSave Loader* on page 88. It is a BASIC loader that POKEs a machine language program into memory beginning at location 2816, the cassette buffer. The ML is relocatable, and can be POKEd elsewhere by changing the variable SA in line 110. Be sure to SAVE the loader before RUNning it for the first time, as it erases itself with NEW when done. The loader prints the range of memory the ML occupies, adding one to the end address so that BSAVE may be used to save the ML. Once the ML has been saved, BLOAD can be used to load the ML to any other location. Available locations include the RS-232 buffers at 3072-3583, the sprite definition area at 3584-4095, and the "applications" area at 4864-7167. The ML requires 253 bytes.

TextSave provides five storage areas for 40-column text information. The syntax for using it is SYS TS, screen #, direction. "TS" is the location of the routine and screens are numbered 0-4. The last value in the SYS statement, "direction," determines whether data flows from the screen or to it. If direction equals zero, the current 40-column text screen is stored. Any direction value 1-255 recalls a text screen. The C-128 must be in the "system" configuration, BANK 15, before calling *TextSave*.

To temporarily open a window, simulating a "pop-up menu," or to call attention to an error condition, use SYS TS, 2, 0 before executing the WINDOW statement. This example stores the screen in area 2. To "close" the window, restoring the previous screen contents, colors, and dimensions, SYS TS, 2, 1.



TextSave ***enables a BASIC 7.0 program to open and close multiple windows, each time restoring the preceding display.***

The video information is stored in an unusual place: 80-column RAM. The 8563 80-column Video Display Controller (VDC) has its own 16K of memory. If you have a dual mode monitor such as the 1902, you can watch *TextSave* move screens 0 and 1 into the 80-column display. They will be only partially readable. As screens 1 and 2 overwrite 80-column attributes, the display becomes more unreadable. The 1024 nybbles of 40-column colors are compacted into 512 bytes, so each screen occupies 1.5K plus 40 bytes for the screen editor values. The routine checks for 40-column mode before taking any action; however, the screen editor will become confused if a screen is recalled before anything has been saved to it.

If usage of *TextSave* is restricted to screens 3 and 4, the 80-column display will still be usable for dual mode applications. The routine will not save the sixteen unused bytes immediately after the text screen, or the eight bytes of sprite data pointers. To store and recall this information as well, POKE TS + 193,0: POKE TS + 197, 8 before calling *TextSave*.

TextSave Demo is a BASIC program that demonstrates *TextSave*. It relies on *TextSave* being at location 2816. Run the loader program or BLOAD the ML before running the demo. The program prints five screens with windows and assorted colors, saving each screen before printing the next.

80-COLUMN MEMORY USAGE: NORMAL V. *TEXTSAVE*

Address	Normal Usage	Address	*TextSave* Usage
0-2047	80-col. text	0-511	screen 0 colors
		512-1535	text
		1536-2047	screen 1 colors
2048-4095	attributes	2048-3071	text
		3072-3583	screen 2 colors
4096-8191	unused	3584-4607	text
		4608-5119	screen 3 colors
		5120-6143	text
		6144-6655	screen 4 colors
		6656-7679	text
		7680-7919	5 sets of editor values (48 bytes each)
8192-16383	character set	7920-16383	unused

When the final window is printed, each keypress steps backward through the previous screens. The REMs provide further explanation of the program's operation.

A SMALL BONUS

TextSave can be used to store other information in the VDC RAM. Since the computer must be in BANK 15 to use this utility, RAM 0 up to address 16383 can be stored. Above 16383 the microprocessor "sees" ROM and I/O. There's little point in saving ROM, although, with caution, I/O register values can be stored and retrieved.

To use this feature, POKE the low byte and high byte of the starting address of RAM 0 memory to store/recall into locations 195 and 196. POKE the end address +1 into locations 174 and 175. Once the start and end are set up, SYS TS + 236, low, high, direction. "Low" and "high" refer to the starting address in VDC RAM to be accessed.

For example, to store a set of sprites at 12288 in 80-column memory:

```
100 POKE 195, 0: POKE 196, 3584/256: REM
START OF SPRITE DEFINITIONS
110 POKE 174, 0: POKE 175, 4096/256: REM
END OF SPRITES +1
120 BANK 15: SYS TS +236, 0, 12288/256,
0 : REM STORE
```

This feature doesn't care which text mode (40/80) is active. It could conceivably be used to store 80-column screens.

If the number of bytes to be moved results in a VDC memory "end" address greater than 16383, the VDC will "roll over" or "wrap" the address to the beginning of VDC RAM.

Since the five 40-column screens stored in VDC RAM take up slightly less than 8K, that leaves slightly more than 8K, beginning at 7920, available for other data, enough for a hi-res bit map. If you're willing to sacrifice one 40-column storage area, a hi-res color map can be stored as well. (If the color matrix and bit-map are stored as one 9K chunk, any 40-column screen editor values *TextSave* has stored will be overwritten. Refer to the table which follows.)

If you're not storing any 40-column screens, the full 16K can be used, and if you're using the 80-column display, the normally unused 4K in VDC RAM at 4096-8191 is available. One warning is in order: Unless the NMI vector is diverted, RUN STOP/RESTORE clears both the 40- and 80-column displays, regardless of which is active. This wipes out anything in VDC RAM below address 4096, including *TextSave* screens 0-2. *TextSave* can be modified to store screens beginning at 8448 in VDC memory. This is accomplished by POKE TS + 97, 33: POKE TS +29, 63. Saved screens will be protected from RUN STOP/RESTORE, but 80 columns will be unusable as screens will be stored in the area normally holding the character bit patterns. To regain the 80-column character set, SYS 49191.

By performing these POKEs "on the fly," *TextSave* could store ten 40-column screens. To restore *TextSave* to its original form, POKE TS +97, 0: POKE TS +29, 30.

The table on page 20 compares *TextSave's* usage of 80-column memory with normal usage. While not as spacious as the 1700 or 1750 Memory Expanders, the 16K of VDC memory provides a modest alternative, at no extra cost. □

SEE PROGRAM LISTING ON PAGE 88

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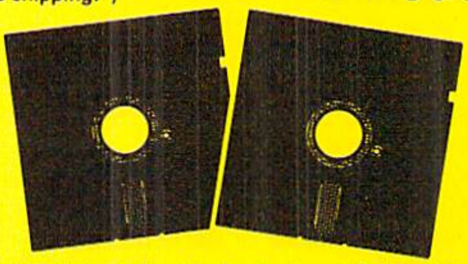
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CLONE-A-MATIC

Easy Copy Utility for All C-64 Files

By Buck Childress

What a pain! Making backup copies of disk files can really try your patience. BASIC programs aren't too bad. You can load them, then make a save to another disk. This gets tiring in a hurry, though. Machine language programs can be a real problem, especially if you're not familiar with ML and ML monitors. Even if you are, you have to know the starting and ending addresses. Sequential and user files are another stumbling block. If you need backups, but are tired of them resulting in Excedrin headache #64, take the easy way out with *Clone-a-Matic.*

Whether you want to make copies of BASIC or ML files, *Clone-a-Matic* is a snap to use. It grabs program, sequential, and user files up to 175 blocks long with equal ease and speed. Even files from word processors can be hacked. Here's how to use it.

After saving a copy of *Clone-a-Matic*, run it. You'll be prompted to insert the source disk into the drive. Next enter the filename. If you want to see the directory, enter $ instead. Don't forget the directory function. It can be real handy if you're making backups of several different files. Now give the type of file. Press P for Program, S for Sequential, or U for User. *Clone-a-Matic* then reads the file into memory.

When it's through reading, you're prompted to insert the backup disk into the drive. *Clone-a-Matic* will write the file to your backup disk. Now that the backup is complete, you have the option of copying another file. Press Y if you want to.

Clone-a-Matic uses machine language to read and write the files and to read the directory, so these functions are performed without delay.

Should you encounter any errors while using *Clone-a-Matic*, the error channel is automatically read and you're informed as to what went wrong.

Because *Clone-a-matic* changes important pointers and disables the STOP and RESTORE keys, there are three times when you can exit. The first two are when you're asked to insert a disk into the drive. You can press the Q key to quit at this time, if you want. The last is when *Clone-a-Matic* asks if you want to copy another file. Pressing any key other than Y will exit. When you leave *Clone-a-Matic* the pointers are returned to normal and the STOP and RESTORE keys are reenabled.

Give *Clone-a-Matic* a test drive. It really gets the job done fast. □

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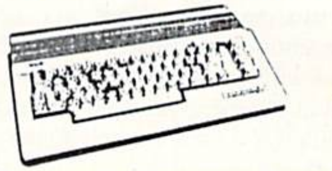
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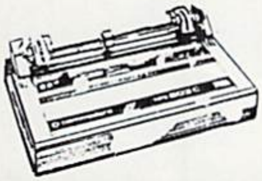
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RUPERT REPORT

We have created machines to do much of our repetitious and tedious work. This month we will investigate two different applications of repetition, mathematical iteration and graphics iteration. Of course, we will let the computer do most of the work.

We will begin with a discussion of the mathematical iteration. If your interests are more of an artistic nature, look ahead to the next section where we will use repetition to create some op-art masterpieces.

MATHEMATICAL ITERATION

The mathematical process called iteration may be represented in this manner:

1. Choose some value for X.
2. Evaluate some function of X.
3. Choose a new value of X based upon the results of step 2.
4. Repeat from step 2 until some criteria are met.

This looks rather abstract. An example should make it more meaningful. For example, there is a procedure taught before the days of calculators for manually extracting the square root of a number. Through a process of successive refinement (iteration), the square root of any number can be calculated to any desired accuracy. The technique of iteration to find mathematical solutions is credited to Sir Isaac Newton, and is called Newton's method.

In order to calculate the square root of a number (in fact, any root of any expression), we will use a procedure related to Newton's method called the secant method. It is very easy to implement on the computer.

For a start, we will find the square root of 3. Perhaps your mathematical background tells you that "find the square root of 3" is equivalent to the problem "find the value of X such that X squared equals 3." This second statement of the problem can be written algebraically:

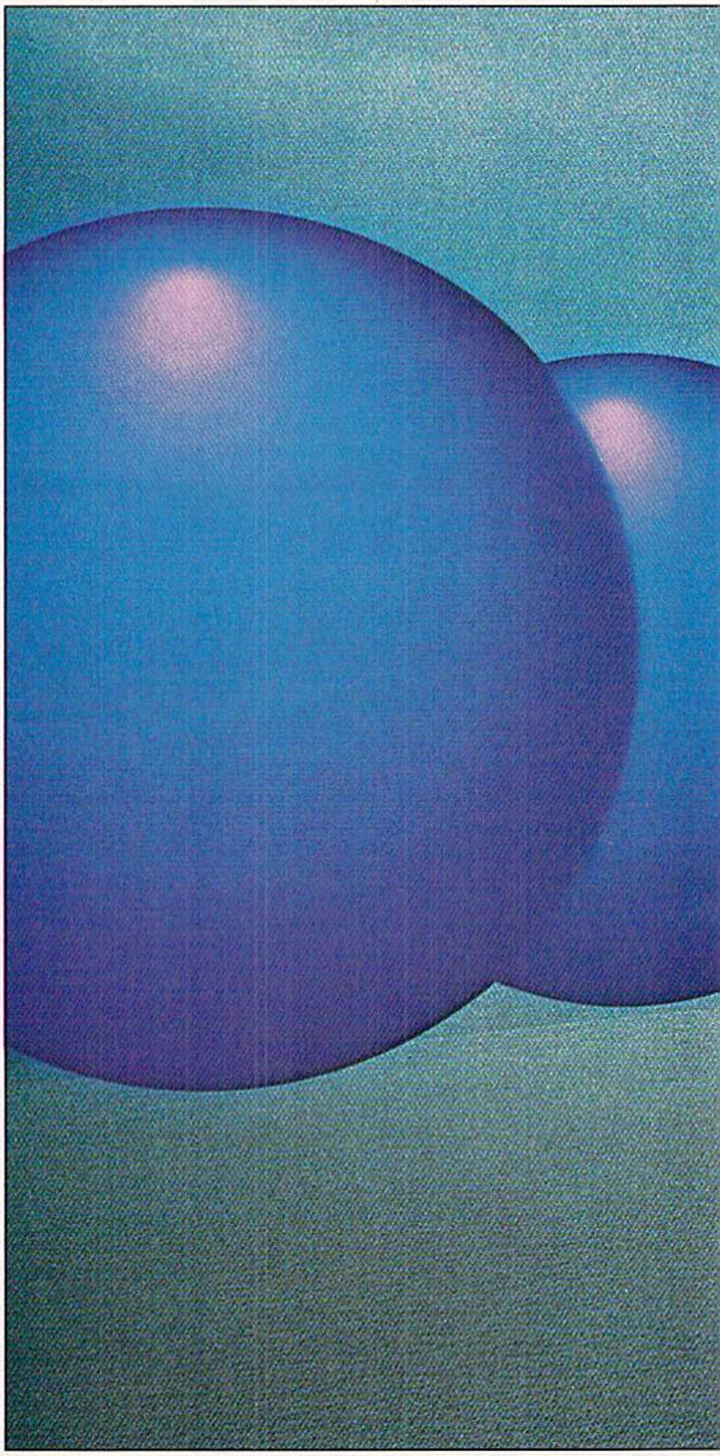
```
X^2 = 3
```

Clearly you might take the square root of both sides of this equation and arrive at the original problem:

```
X = SQR(3)
```

where SQR is the BASIC square root function. Your calculator or computer effortlessly tell you that the correct value of X in the second equation is approximately 1.732.

We will use iterative methods to find the root of the first equation. The root is nothing more than the value of X which makes both sides of the expression equal. First we



subtract 3 from both sides of the equation to get the two terms on one side, leaving zero on the other side:

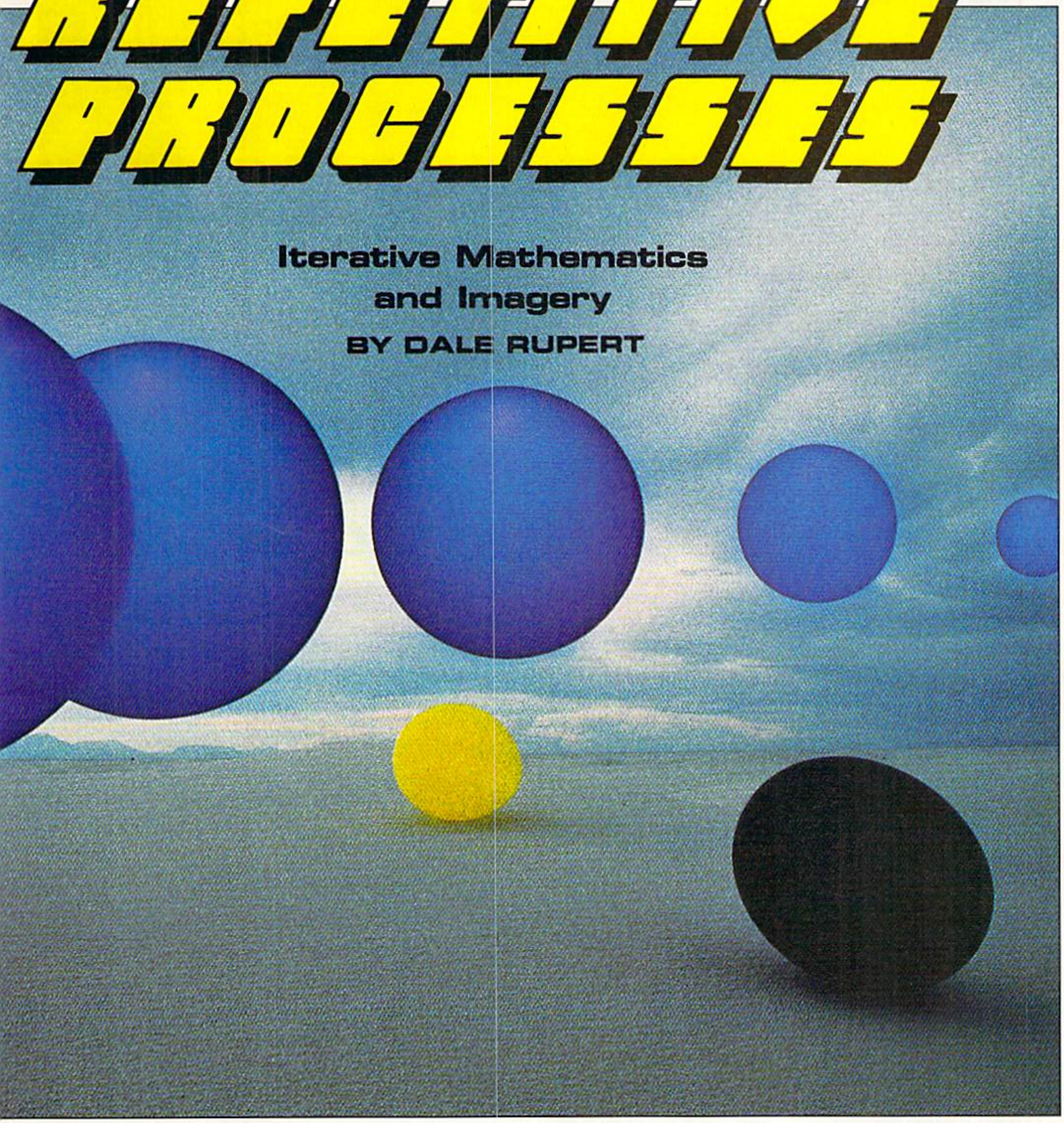
```
X^2 - 3 = 0
```

Finding a root of this equation is equivalent of finding a *zero* of the expression $X^2 - 3$. A zero is merely a value of X which makes the expression on the left equal to 0. That is just what we are looking for.

REPETITIVE PROCESSES

Iterative Mathematics and Imagery

BY DALE RUPERT



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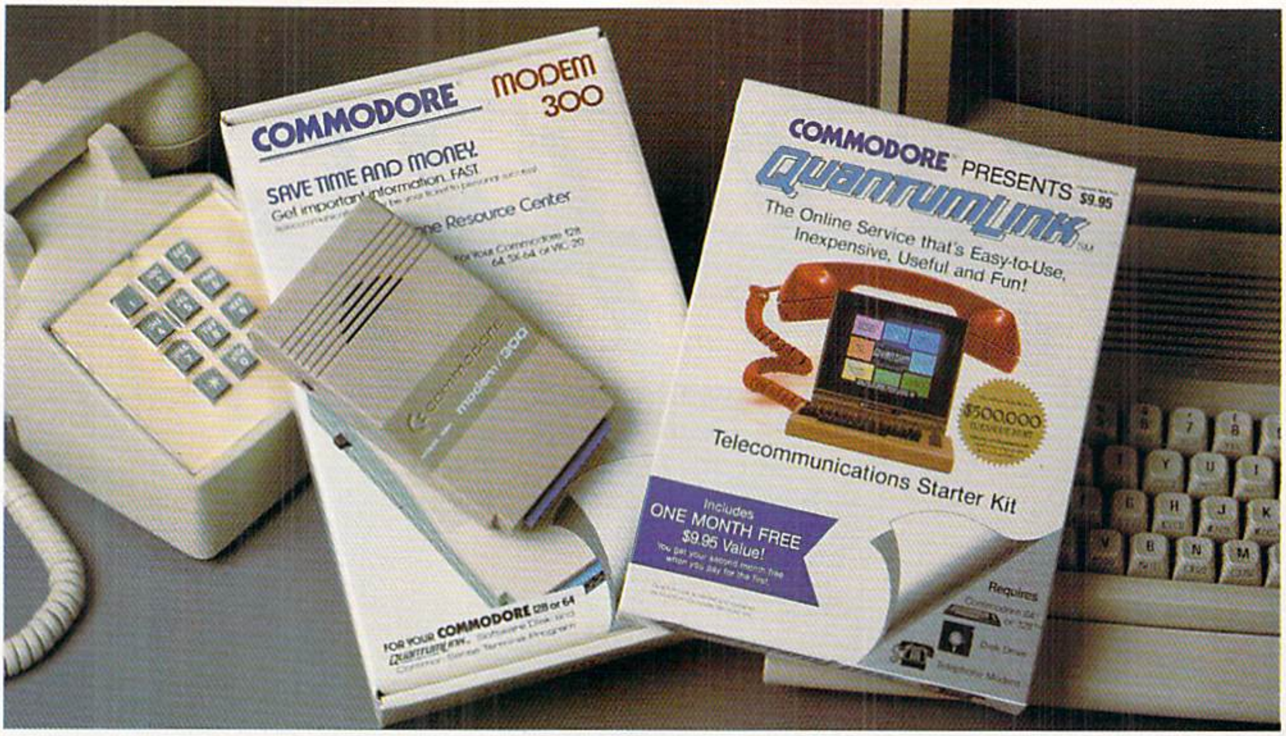
We will define the function of X this way in BASIC:

```
DEF FNA(X) = X ^ 2 - 3
```

If we tell the computer to PRINT FNA(7), it substitutes the value 7 for X in the right side of the function definition. It calculates 7 squared minus 3 and displays 46. Clearly 7 is not a zero of the expression since the result of using 7 for X gives 46, not 0. If we tell the computer PRINT FNA(1), it replies −2 since 1 squared minus 3 is −2. From this we see that X=7 gives a result that is too large (46) and X=1 gives a result that is too small (−2). We are looking for a result of 0.

Let's first perform a crude form of iteration to find a zero of the expression. Try this:

```
10 DEF FNA(X) = X ^ 2 - 3
20 FOR X=1 TO 7 STEP 0.01
```



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```
30 PRINT X,FNA(X)
40 NEXT X
```

Watch the numbers in the right hand column flow by. Be ready to press the RUN STOP key when you see the values change from negative to positive. You know that the zero of the expression is right at that transition.

On my screen the relevant values of X and FNA(X) shown are

1.72999998	-7.10005499E-03
1.73999998	.0275999429

In rounded terms, FNA(1.73) is roughly −0.007 and FNA(1.74) is 0.028. That means the zero we are looking for is an X value between 1.73 and 1.74. If two-digit accuracy is all we need, then we have found the square root of 3. It is 1.7.

You could easily change the STEP size in line 20 if you need more accuracy. It would not be difficult to add some logic to the program to stop whenever the values of FNA(X) change from negative to positive. Your program could automatically tighten up the FOR-NEXT limits and repeat the process with smaller STEP sizes until any desired accuracy within the limits of the machine is obtained. This is a very understandable form of iteration. There is nothing mysterious about it.

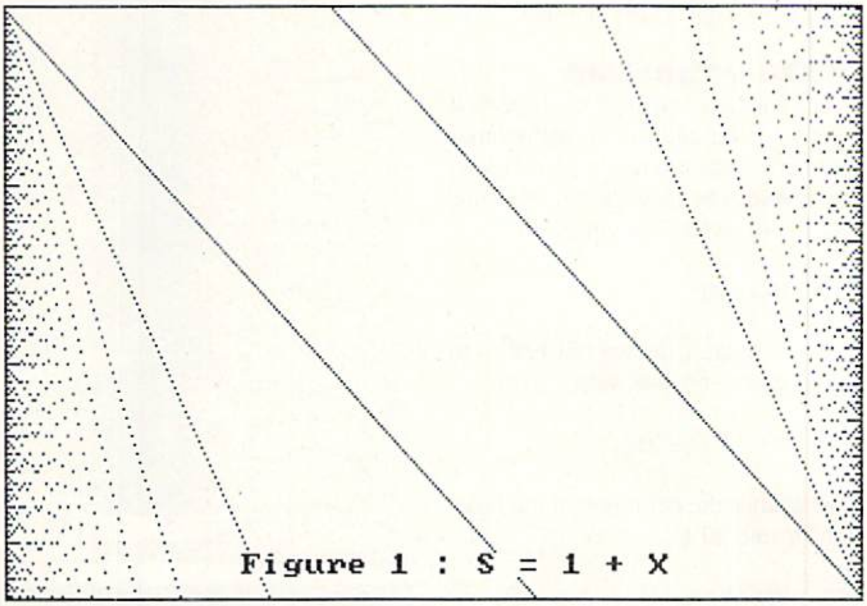


Figure 1 : S = 1 + X

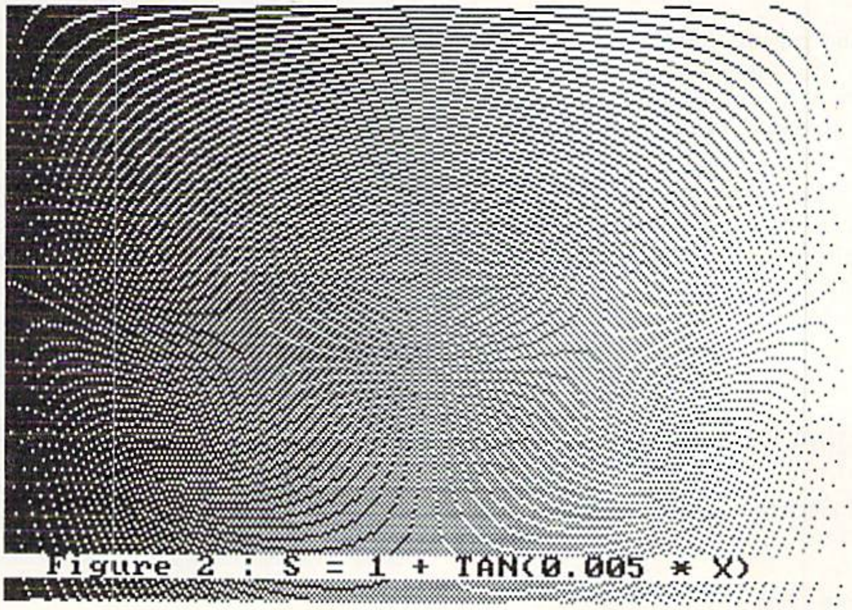


Figure 2 : S = 1 + TAN(0.005 * X)

The secant method uses some mathematical sophistication to speed up the iteration process. We won't go into the theory of the method. Books on numerical analysis and numerical methods for the computer provide the theory if you are interested. The implementation is very straightforward. Refer to *Iterative Solutions* on page 87. (The program as listed is for the C-128; C-64 users see below.)

We must provide two initial values, X0 and X. They may be any two differing values, but their choice may affect the speed of finding a solution, and it may affect the particular solution which is found (if there are more than one). Line 20 arbitrarily picks 0 and 1 for initial values.

The iteration is performed within the loop defined by DO in line 30 and LOOP WHILE in line 80. Lines 40 through 70 are repeated as long as the condition in line 80, ABS (DELTA) > 0.0001, is true. Then the loop is exited and the program ends. (C-64 users refer to the changes in lines 110 through 130.)

The quantity which is called DELTA is a function of two different values of X, the current value X and one previous value X0:

```
DELTA = (X-X0) / (1 - FNA(X0)/FNA(X))
```

Line 50 saves the current value as the previous value once it has been used to calculate DELTA. In line 60, a new value of X is calculated from the current value of X and DELTA:

```
X = X - DELTA
```

Line 70 displays the progress, printing X and FNA(X). If all goes well, DELTA approaches zero, implying that X is not changing much. FNA(X) eventually gets close to zero and the value of X is then the desired zero of the expression.

It would be possible to replace the conditional test in line 80 with ABS(FNA(X)), since as DELTA approaches zero, so does FNA(X). However, this gives a speed disadvantage, since FNA(X) would have to be evaluated again. The absolute value ABS is used since it gives a measure of the "dis-

tance" that a number is from 0, regardless of the sign of the number.

OTHER PROBLEMS

The iterative method we have just discussed is applicable to many other problems than finding square roots. How about cube roots? To find the cube root of 40, write the equation

```
X ^ 3 = 40
```

then rearrange it as we did before to get all terms on one side:

```
X ^ 3 - 40 = 0
```

Now change the definition of the function in line 10 to

```
DEF FNA(X) = X ^ 3 - 40
```

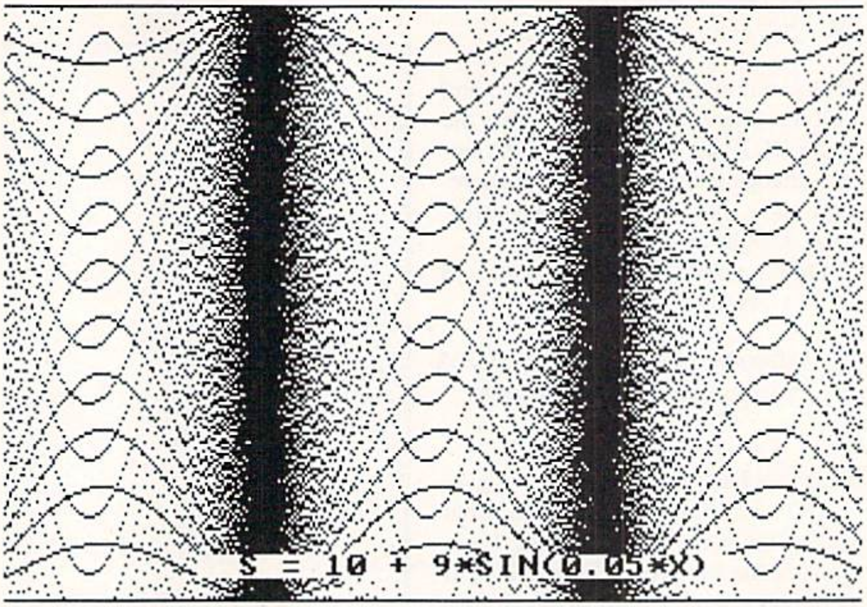
and run the program. In a few moments, the computer states that FNA(X) is essentially zero when X is 3.41995189. That is pretty close to the cube root of 40.

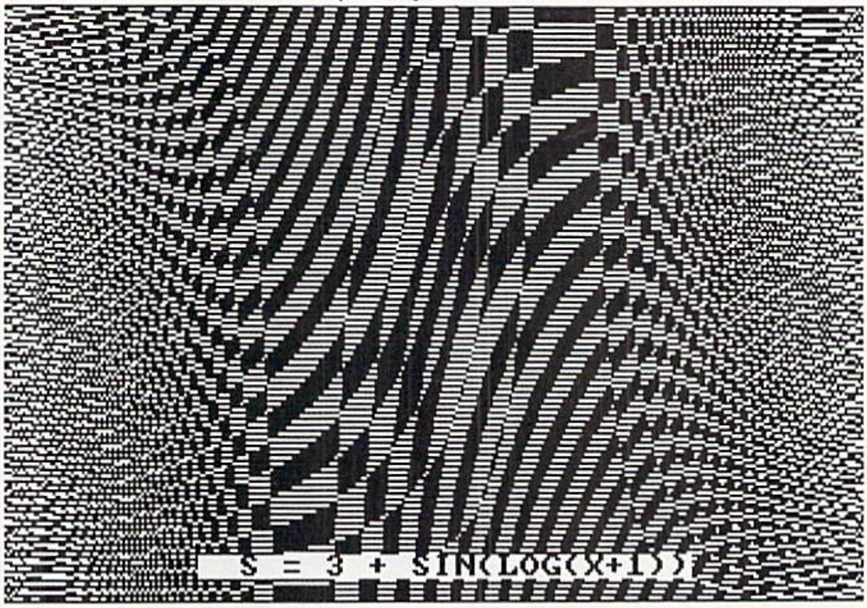
How would you find a value of X for which the trigonometic sine of X equals the tangent of X+3? Use the same procedure. Write the equation, then rearrange it:

```
SIN(X) = TAN(X + 3)

SIN(X) - TAN(X+3) = 0
```

Change the function definition in line 10 to






```
DEF FNA(X) = SIN(X) - TAN(X+3)
```

and very quickly have the answer X=0.729 radians.

What number is 5 more than its own square root? Find the answer by writing

```
X = SQR(X) + 5
```

or

```
X - SQR(X) - 5 = 0
```

Line 10 becomes

```
DEF FNA(X) = X - SQR(X) - 5
```

Here we quickly run into trouble. With the initial values given, the denominator of FNA(X) is zero, producing a "Division by zero error in 40".

Changing the initial values to X0=0 and X=3 leads to another problem. The value of X becomes negative, and the computer gives an "Illegal quantity error in 70" when it tries to evaluate the square root of a negative number.

One possible way around this problem is to substitute Y for SQR(X) so that X becomes Y ↑ 2. Change line 10 to

```
DEF FNA(Y) = Y^2 - Y - 5
```

(Note that the variable used in the DEF statement does not really matter.) Since we are now trying to solve an equation which is the square of the original variable, we may end up with an answer which doesn't belong to the original. (In the words of our algebra teachers, we had better check our answers.)

In fact, this time we succeed. The computer gives a value 2.7912874 as the root of our equation. This corresponds to Y which is actually the square root of X. The answer

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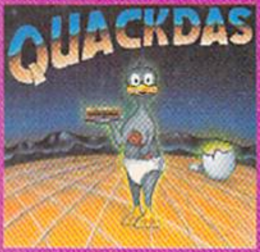
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+ = – + ! ! (Crabnebula Computer Art & Design)

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? ? ? ? ? ? ? (The Hitchhiker's Guide to Galaxian Software)

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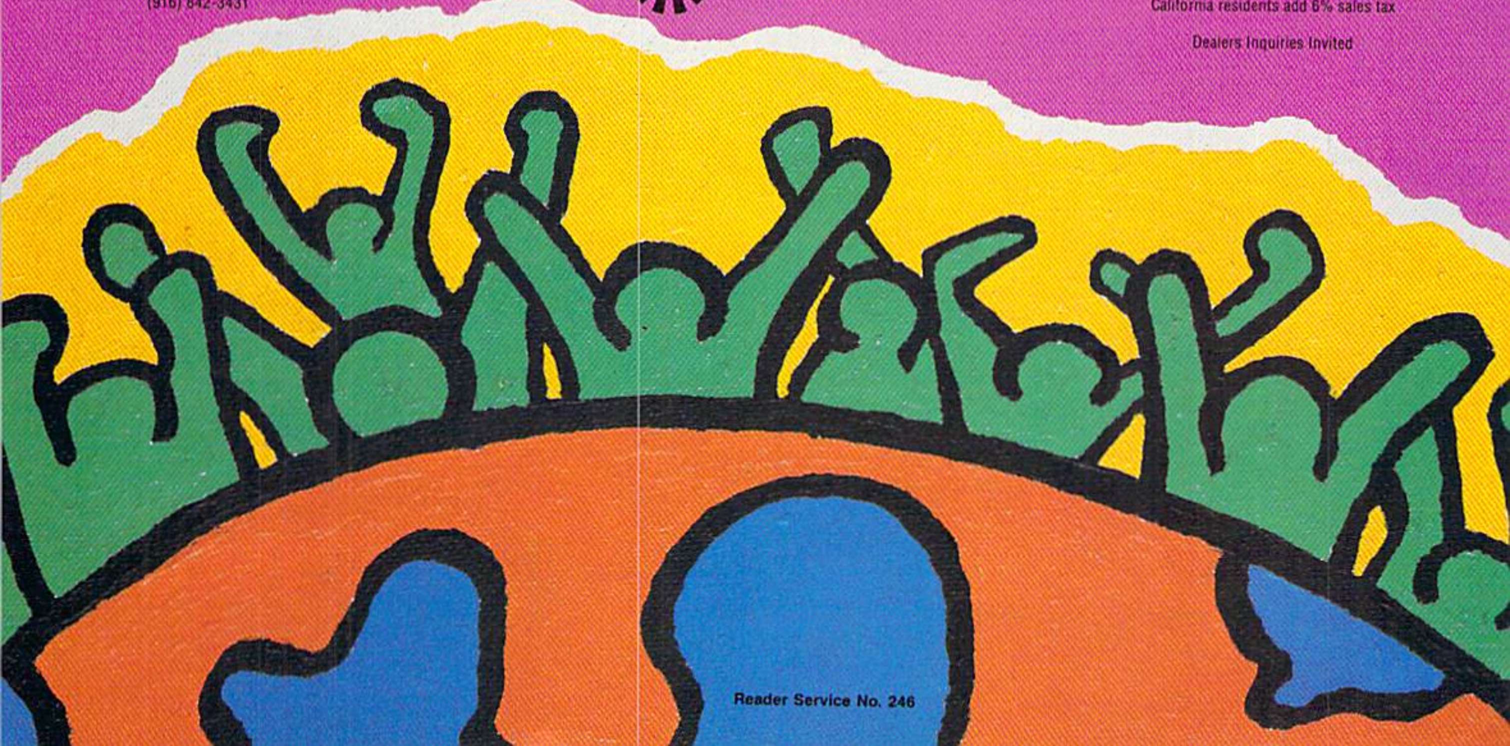
". . . what can you say about a software company that markets posters. The fabled Mandelbrot Set is now captured on paper (where available — some restrictions might apply), using the highest resolution ever experienced to date . . ."

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to our problem is X = 7.7912878, and it checks! This number is 5 more than its square root.

If you want real troubles, try finding the number which is 5 *less* than its square root. You will quickly get into complex numbers (with real and imaginary parts), a topic we will reserve for future discussions. With this problem, the secant method happily iterates as long as you let it. It never converges to a root, since there is no real root.

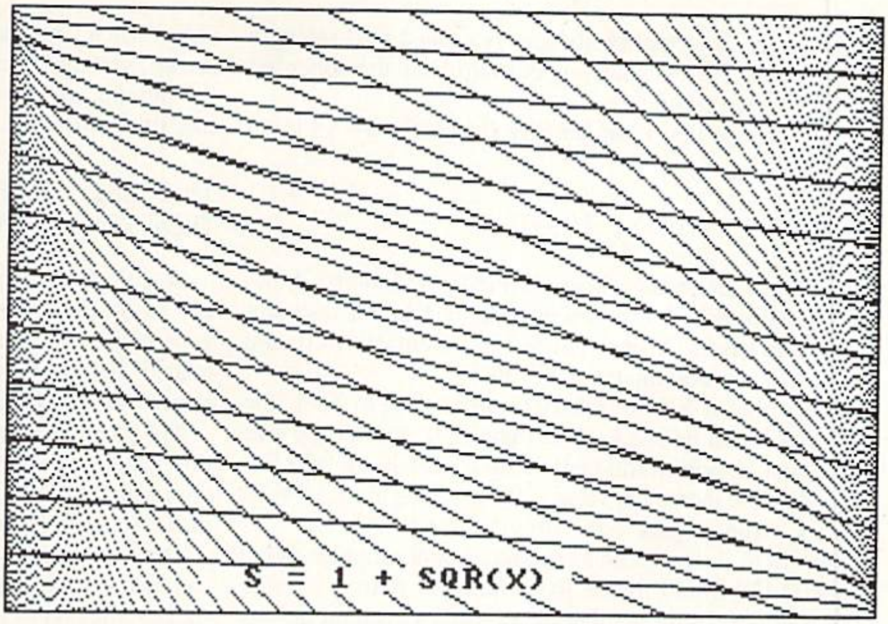
You may find other problems which the secant method can't handle. There are several other iterative methods available, although each has its own problems of more complicated programming, slow performance, or limited applications. The secant method is a good general purpose method, but it is not foolproof. Refer to a text on numerical analysis for other possibilities.

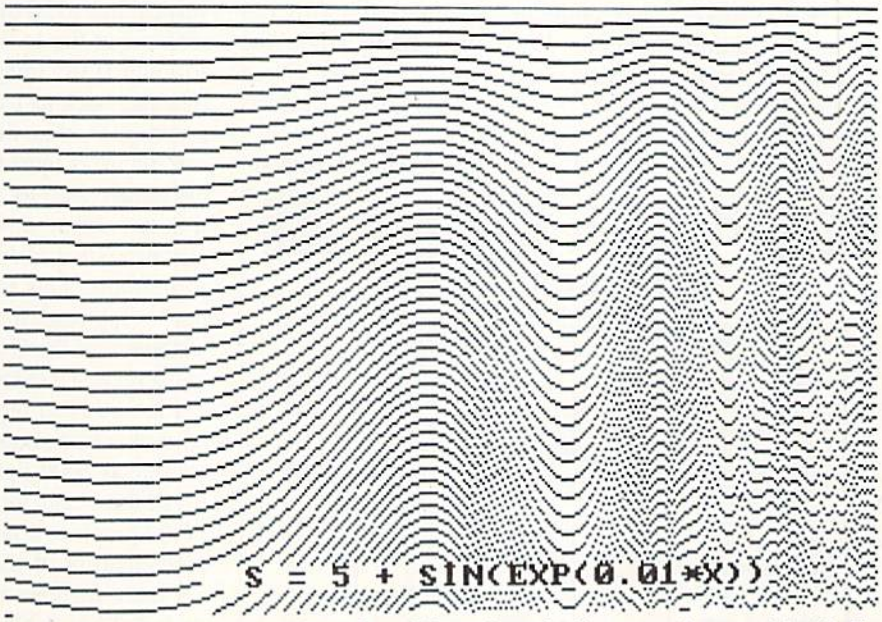
We will leave mathematical iterations with a final example which shows the importance of the initial values for X0 and X. Change line 10 to

```
10 DEF FNA(X)=SIN(X)
```

What values of X make SIN(X) zero? There are infinitely many of them. The general expression is X = n * PI where n is any integer, PI is roughly 3.14, and X is in radians.

When you run *Iterative Solutions* with X0=0 and X=1, the program gives a divide by 0 error. In line 20 change X0 to 1 and X to 3, and the root X=3.14 is quickly reached. Now change X0 to 3 and X to 6. The solution is found to be 6.28. In general, the solution reached depends upon the initial values. A rough graph of the equation may help to choose the initial values in order to find the desired root.





ITERATIVE IMAGES

After that mathematical workout, let's take it easy with some interesting graphics. We will experiment with a very simple program to produce surprisingly complicated-looking graphics. Refer .o the program *Iterative Designs* on page 87.

The program draws points on the screen. The points are drawn along vertical lines from the top of the screen to the bottom, and the lines progress from left to right. The vertical spacing between the points on each line depends upon a formula which we will manipulate.

The program is written for the C-128, which uses the DRAW 1,X,Y command to plot a point at coordinate (X,Y). (Use *Iterative Designs 64* for the C-64.) The screen coordinate system runs left-to-right horizontally (the X direction) from 0 to 319, and vertically top-to-bottom (the Y direction) from 0 to 199.

The outer X loop defines the horizontal position of each vertical line. The inner Y loop moves downward with step size S along the given line, plotting a point at every position which is a multiple of S.

For example, assume the formula for S in line 40 is S=X+1, where X runs from 0 to 319. The first vertical line at X=0 would consist of all points a distance 1 apart (S=1). The next vertical line at X=1 would contain every other point since S has the value 2. The third vertical line at X=2 would contain every third point since S is 3, and so on. This continues until the last vertical line at X=319 is plotted. Here Y is initially 0, so the top dot is plotted. The step size S is now 320, so Y is incremented to 320. Since that is outside the range of the Y loop, the program ends.

Consequently the result of S=X+1 is a collection of vertical lines, each of which has fewer points plotted on it than the adjacent one to the left has. That's how it should look

theoretically. In actuality, the eye is tricked into seeing a series of diagonal lines fanning outward from the upper left corner of the screen.

If you change line 40 in *Iterative Designs* to S=X+1 and add line 65,

```
65 DRAW 1, 319-X, 199-Y
```

you will get the results shown in Figure 1. Line 65 draws the same image as line 60 except that its X and Y coordinates are reversed. X goes left to right from 319 to 0, and Y goes top to bottom from 199 to 0.

Notice that if S were set to X rather than to X+1, the program would be stuck. X is initially 0, so the step size of the first Y loop would be 0. FOR-NEXT loops take forever when the increment value is 0! Keep that in mind when you try some of your own formulas for S.

Line 10 of the program saves the current graphics mode of the C-128 in G0. If the RGR function returns a value of 6 or greater, it means that the original screen mode was 80-column mode 5. My computer automatically switches from 80-column mode to 40-column mode when the GRAPHIC 0 statement is executed in line 20 (see *Green Screen Blues*, August 1987 *Ahoy!*). GRAPHIC 1,1 selects and clears the hi-res graphics screen.

If you generally use the 80-column screen but must manually switch your monitor back and forth to the 40-column screen, you might add a statement prompting you to switch the monitor and to press any key when ready. Something like this will work:

```
15 PRINT "FLIP THE SWITCH TO 40-COLUMNS
THEN PRESS ANY KEY" : GETKEY A$
```

Line 90 causes the program to wait for you to press any key to continue. That way you can get a screen dump to your printer or to a disk file (if you have such software loaded) before switching back to the text screen. Line 100 returns to the original text mode.

Not much more needs to be said about the operation of this program. I have had several evenings of enjoyment changing the formula for S in line 40 and watching the display. Hopefully you will too.

The main problem with the program is its speed. You can increase the speed significantly by putting a STEP statement at the end of line 30. STEP 5 would cause every fifth vertical line to be drawn. This is a handy way to get a rough idea about the looks of a new S formula without waiting so long. If the image looks promising, change the X loop step size back to 1 to get the highest resolution. If you have a compiler, this would be a program for it.

C-64 users must use *Iterative Designs 64* which produces the same results as *Iterative Designs* just discussed, although it is somewhat slower. The graphics routines were originally presented in June 1985's *Rupert Report, The Ultimate Resolution*. This program uses a set of subroutines in order to duplicate the graphics modes and the point DRAW statement of the C-128. GOSUB 1000 initializes the graphics screen. GOSUB 3000 returns to text mode.

Line 60 (and any other DRAW statements such as line 65 mentioned above) are replaced with GOSUB 2000. The routine at 2000 lights the pixel at coordinate (X,Y). Refer to the June and July 1985 *Rupert Reports* for a discussion of the graphics routines and for an assembly language implementation of them.

Figure 2 shows the results for S given in the listings: S = 1 + TAN(0.005 * X). Figures 3 through 12 show some of the other patterns possible with these programs. You might add other lines such as

```
66 DRAW 1,199-Y,199-X
```

for even more variation.

We have briefly delved into the concepts of mathematical and graphical iteration. More sophisticated iterative processes are available which can produce even more powerful images. We will discuss some of these other procedures in future articles. This was just our first iteration of the subject. ☐ ***SEE PROGRAM LISTINGS ON PAGE 87***

For more information on products advertised or pictured in *Ahoy!*, fill out and return the reader service card bound between pages 66 and 67.

THE YEAR'S BEST ENTERTAINMENT

Finest Funware of 1987 for the C-64/128

By Arnie Katz and the editors of *Ahoy!*

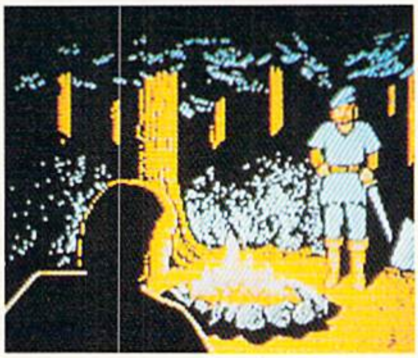
The biggest Commodore software news story of 1987 concerns something which *didn't* happen. Despite dire predictions, the Commodore 64 and 128 home computers are alive and thriving as 1988 begins. The 64 and 128 still represent the third largest potential audience for home computer software, trailing only MS-DOS and Apple II.

Some of the software publishers who had backed away from the C-64/128 in mid-1986 reconsidered and then increased new product introductions in mid-1987.

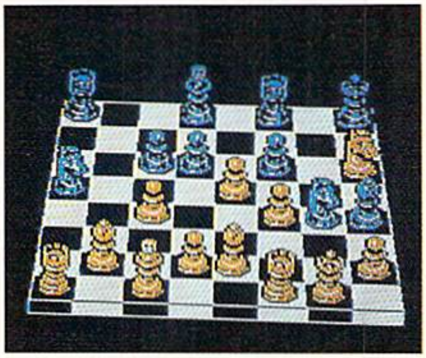
Over 200 titles joined the Commodore 64/128 library of entertainment software in 1987, counting US editions of programs originally distributed in England, Japan, and other countries. Although the number of entertainment software programs developed primarily for the Commodore is still declining, there is no shortage of new top quality titles.

When *Ahoy!* entertainment editors reviewed the year just ended, they quickly compiled a list of nearly 50 outstanding new programs. There were at least another 50 which the judges felt they could recommend wholeheartedly. We've winnowed those 100 or so serious contenders down to the best of the best for this annual presentation. It was hard to leave so many fine programs unrecognized. There's no doubt that many of them would have won awards in 1986 or 1985.

The introduction of 16-bit computers has sharply reduced new product development on the Commodore, but the effect has not been totally negative. The process of transferring games originally designed on higher memory systems to the C-64/128 has taught programmers a lot about how to get the biggest bang for the byte. The Commodore editions of titles like *Defender of the Crown* and *The Pawn* have apparently raised the standard of quality for the entire Commodore software field.



Defender of the Crown: ***more options.***
READER SERVICE NO. 213



Chessmaster 2000: ***multiple views.***
READER SERVICE NO. 214

The writers who regularly cover entertainment software for *Ahoy!* have collaborated on this survey of the best funware for the Commodore. The compilers hope that readers whose favorites didn't make this year's list will be understanding and charitable about this difference of opinion. The judges also apologize to publishers whose worthy submissions arrived just a little too late to make the deadline for inclusion. Rest assured, these disks will get their deferred justice next January.

The authors' modesty prohibits the inclusion of several new titles in this survey: *Omnicron Conspiracy* (Epyx) and *WWF Microleague Wrestling* (MLSA) were designed by Subway Software (Arnie Katz, Bill Kunkel, and Joyce Worley). Modesty does have its limits, however, so we hope you rush out and buy them.

Now, let's go to the games...

Strategy

Although the Commodore 64/128 remains an excellent medium for action contests, the brain games continue to dominate. The Game of the Year in 1986, *Elite* (Rainbird/Firebird Licensees), was a strategic challenge, and so is this year's top disk, *Shanghai* (Activision).

It would be hard to imagine two more different products. *Elite* is a science fiction epic which crams an unbelievable amount of detail into a highly playable simulation of economic and military activity in outer space. This year's winner, *Shanghai*, is an elegantly simple contest which is the closest thing to a classic strategy game yet developed for the computer.

Shanghai contains elements of both solitaire and Mah-Jongg. The process of removing matching pairs of tiles from the playfield exerts an almost hypnotic effect on players, some of whom claim that an evening with *Shanghai* is the closest thing to a Zen experience the electronic world can offer.

The ultimate strategy game, chess, gets a fresh treatment in *Chessmaster 2000* (Software Toolworks). Not only does this program push pawns as expertly as any previous disk, but its flexibility and features, including multiple views of the board and several sets of pieces, make *Chessmaster 2000* the top choice for novices and grandmasters alike.

Another boardgame, *221B Baker Street* (Intellicreations), has also found new glory on the computer screen. Amateur sleuths travel around the elaborate playfield to collect clues and solve mind-teasing crimes.

Robot Rascals (Electronic Arts) is a multiplayer contest which mixes onscreen action with non-electronic ac-

tivity. Participants swap cards, set tactical traps for the unwary, and interact in a personal way which is rare in a computer game. This souped-up scavenger hunt guarantees evenings of fun for the entire family.

President Elect 1988 (Strategic Simulations) falls into a gray area with regard to our honor roll, since it isn't completely new. An early version of the program premiered in 1983.

The revision's graphics are still primitive, but *President Elect's* premise is so compelling that most computerists will gladly overlook this shortcoming. The opportunity to personally experience historical and hypothetical elections makes *President Elect 1988* a terrific strategy game.

Military Simulations

Wargames, though nominally strategy contests, are a breed apart. Many computer generals play no other type of game, and quite a few ardent gamers are largely ignorant about military simulations.

Actually, computers are breaking down the walls of the wargame ghetto. Computerized military simulations are easier to learn, set up, and play than the non-electronic equivalent. This has allowed some of those who previously shied away from wargames to enjoy the mental challenge without the drudgery associated with military boardgames and tabletop miniature soldiers.

The same game-system which made *Gettysburg: The Turning Point* a winner last year put the sequel, *Rebel Charge at Chickamauga* (Strategic Simulations), over the top in 1987. This recreation of a pivotal Civil War battle exemplifies the strengths of state-of-the-art computer wargaming. Lucid documentation and smooth play mechanics let armchair commanders concentrate on winning the battle rather than navigating safely through a 100-page rulebook.

The futuristic *Ogre* (Origin Systems) presents a situation so unique that it will probably interest many computerists who normally keep wargames at arm's length. The tactical situation is unusually clear-cut, since the human player has only a few units in the struggle against a computer-directed supertank on the battlefield of tomorrow.

Warship and *Wargame Construction Set* (both SS) appeal to somewhat more experienced wargamers. Their scenario construction systems extend the life of the game, because they permit the user to concoct fresh situations after the old ones are thoroughly played.

Definitely for the wargaming connoisseur are *Russia* and *Battles in Normandy* (Strategic Studies Group). The computer wargame field's leading design team scored a double hit in 1986 with expert level simulations of Eastern and Western front action in World War II. Authors Roger Keating and Ian Trout create the most accurate, challenging, and mentally demanding computer wargames on the market.



221B Baker Street: ***mind-teasing.***
READER SERVICE NO. 215

Adventures

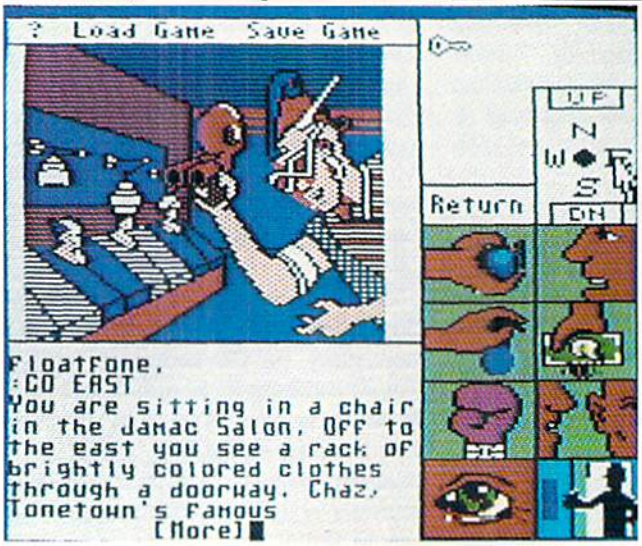
Diversity continues to be the hallmark of adventures for the Commodore 64/128. This year's best includes everything from a parser-driven text quest to a joystick-driven graphic adventure. Themes are similarly varied.

Sid Meier reveals a previously hidden talent for designing adventures in *Pirates* (MicroProse). Though widely known as a creator of simulators, Meier shows a deft hand in constructing this romantic high seas epic.

Interplay Productions teamed with independent designers to contribute two titles to the honor roll, *Tass Times in ToneTown* (Activision) and *Bard's Tale II* (Electronic Arts) this year. The former is a science fictional "Through the Looking Glass" which sends the player into a strange alternate world, while the latter continues the fantasy role-playing fun of 1986's *Bard's Tale.*

Master Designer Software specially revamped its *Defender of the Crown* (Mindscape) for the C-64/128. Their efforts yielded an arcade adventure with more strategic options than the Amiga original. It also looks better than almost all other Commodore games. The arcade sequences won't tax the average adult's coordination, yet effectively convey the spirit of the England of Robin Hood.

Some of Lucasfilm's previous titles seemed like little more than sophisticated videogames, but *Maniac Man-*



Onscreen icons make it possible to play **Tass Times in ToneTown** ***with a minimum of typing. The object is to find Gramps, missing in a village in a strange alternate dimension.***
READER SERVICE NO. 216



Maniac Mansion: ***superbly decorated.***
READER SERVICE NO. 217

sion (Activision) is on the cutting edge of the computer adventure field. The superb artwork, cute onscreen characters, and haunted house plot give this joystick-activated contest tons of appeal for children and adults alike.

Martial arts action enlivens the more cerebral aspects of *Moebius* (Origin Systems). The player must master several mental and physical disciplines in order to succeed in this exotic quest game.

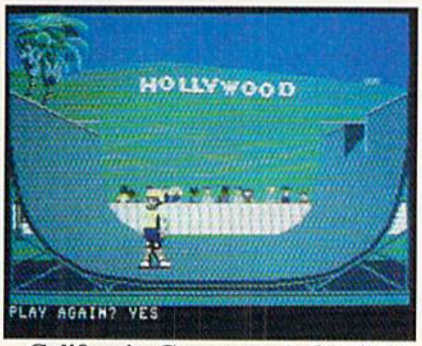
Sports

Quantity rose, but quality remained spotty in this popular category. Several games featured a frustrating blend of very good and very bad features. Still, there were at least four new entries which would improve anyone's software library.

The wait for a basketball statistical simulation with good graphics is over. *NBA* (The Avalon Hill Game Co.) and *Pure-Stat College Basketball* (Software Simulations), both designed by Ed Daniels and crew, are the hoop equivalent of *Super Bowl Sunday.* And that, as regular *Ahoy!* readers know, is high praise indeed.

Superstar Ice Hockey (Mindscape) signals the return of Ed Ringler to the computer sports arena. This action-strategy treatment of the world's fastest team sport provides for individual games and extended league play against computer or human coaches.

Skeptics have wondered when Epyx would run out of subjects for sports anthologies. *California Games* indicates that the well hasn't gone dry yet. This disk lacks the drama of an Olympic competition, but the games are handsomely illustrated and fun to play. As befits the subject matter, *California Games'* many humorous touches keep participants in a suitably light mood during events like skateboarding and the flying disk toss.



California Games: ***suitably light.***
READER SERVICE NO. 218



Marble Madness ***will stymie the best.***
READER SERVICE NO. 219



Gauntlet: ***gripping fantasy adventure.***
READER SERVICE NO. 220

Also meriting mention is *World Class Leader Board* (Access). The Carver Brothers have further improved last year's already excellent *Leader Board*. This is now the best golf program for the Commodore 64/128 computer system.



Fist: ***a combat/adventure combination.***
READER SERVICE NO. 221

Action

Software publishers made our 1986 prediction of an upswing in action contests look pretty good. Action-strategy titles are still much more popular than pure joystick jamborees, but the blast brigade won't be too disappointed with the 1987 crop.

The home version of *Marble Madness* (Electronic Arts), a popular 1985 coin-op, is the best new action game of 1987 for the Commodore. Directing the rolling ball around the split-level playfield is more a question of timing than speed, but it takes excellent reflexes to keep the marble moving through the tricky terrain.

Also fresh from the commercial arcades is *Gauntlet* (Mindscape). Although this fantasy free-for-all can be enjoyed solo, it really comes into its own as a two-player contest. Computerists choose characters, storm the huge multilevel dungeon together, and cooperate to kill monsters, find useful objects, and advance to the next level. As long as one character remains alive, the other reincarnates, so two determined adventurers can charge and blast for hours.

Another high quality sequel is *Fist: The Legend Continues* (Mindscape). UXB has transferred the concepts introduced in *Way of the Exploding Fist* (Spinnaker) to an adventure game setting. This makes *Fist: The Legend Continues* much more involving than the typical hand-to-hand combat program.

Beautiful fine-line graphics are the greatest attraction of *Starglider* (Rainbird/Firebird Licensees). But this lovely flying and shooting contest is more than empty calories. The action is varied and exciting as the computerist commands the graceful ship against a universe of foes.

Action-Strategy

Up to about four years ago, most computer games employed keyboard input. These days, many strategy games utilize joystick-activated command control to increase player interaction and involvement.

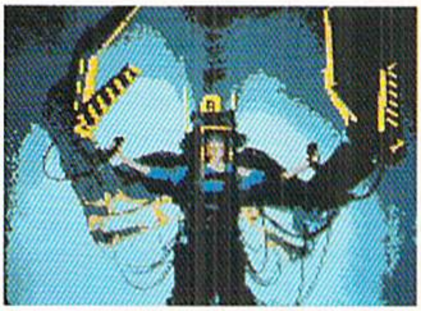
Another part of the appeal of action-strategy programs is that they test the ability to think fast. Time pressure can boost the excitement level of an action-strategy game almost as high as a pure action contest.

Aliens (Activision), based on the science fiction film, captures the essence of the action-strategy category. Con-

frontations with the marauding creatures are arcadelike sequences, but winning requires the computerist to skillfully deploy crew members to meet



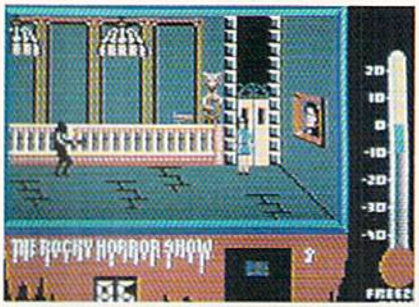
Aliens: ***out of this world action.***
READER SERVICE NO. 222



Aliens ***contains arcadelike sequences, but winning requires strategy.***

the constant threats from the dreaded aliens.

Rocky Horror Show (Activision), based on the cult classic film and stage play, gives the player the chance to do more than just wear a costume and shout lines at an uncaring movie screen. In truth, *Rocky Horror Show* could be called a graphics adventure with equal justice, because the player really gets into the bizarre world of Dr. Frankenfurter, Magenta, and the rest. We placed it here because it empha-

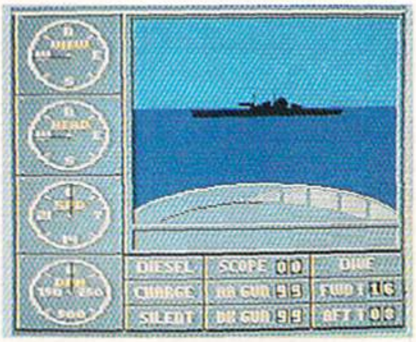


A toast to the **Rocky Horror Show.**
READER SERVICE NO. 223

sizes movement around the mansion and avoidance of contact with computer-controlled objects as well as puzzle-solving.

Monster Movie (Epyx) allows the computerist to take the role of one of several different movie menaces and ravage various world capitals. The cities, depicted in two-thirds perspective, make enticing targets, and the game's movie theater framing device puts players in the proper frame of mind for all the monster mayhem.

Auto Duel (Origin Systems) blends menu-activated adventuring with real-time vehicular combat. The non-electronic "Car Wars," on which *Auto Duel* is based, is a straight strategy contest, but the addition of action elements makes the electronic version much more immediate and exciting.



Sub Battle Simulator: ***lots of detail.***
READER SERVICE NO. 224

Into the Eagle's Nest (Mindscape) is a distant cousin of the venerable *Castle Wolfenstein.* The player uses the joystick to control a heroic commando who must infiltrate a four-story stronghold to accomplish a series of risky missions. *Into the Eagle's Nest* has enough shooting to wear out any trigger finger, but the action is far from mindless. Each of the enemy positions is a tactical problem which the commando must handle before German guns put a period to his exploits.

Computerized simulators are the most sophisticated action-strategy games for the home computer. This type of program is still gaining popularity, and there were at least three great ones produced last year.

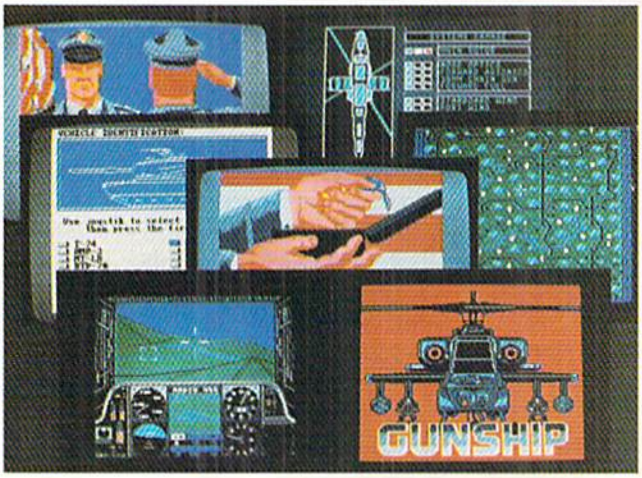
Gato (Spectrum Holobyte) and *Sub Battle Simulator* (Epyx) concern undersea warfare, while *Gunship* (MicroProse) is the first comprehensive helicopter combat program. All sport good graphics, extensive documentation, and plenty of realistic detail.

Looking Forward

Development of new entertainment software for the Commodore rebounded as predicted a year ago. Now the big question is: Will the resurgence continue in 1988?

It is always tempting to forecast a boom, because it makes everyone happy. It would be overly optimistic, however, to predict that Commodore 64 entertainment will ever again equal 1985's output in quantity. The higher memory systems are here, and they will gain increasing acceptance through the end of this decade.

On the other hand, the Commodore 64/128 has not disappeared, and hardware is still selling well. Software publishers won't abandon Commodore owners as long as they represent such a huge potential sale. So, though quantity won't set records in 1988, there won't be any shortage of new products either. And with design and programming techniques still marching forward, it is likely that these new programs will keep gamers playing happily during the next 12 months. ☐



The **Gunship** ***flight simulator from MicroProse puts the player at the controls of a modern combat helicopter. Detailed first-person graphics provide an exciting view of the action.***
READER SERVICE NO. 225

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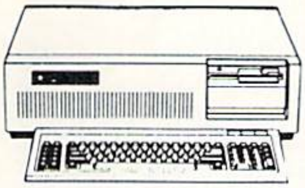
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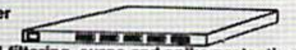

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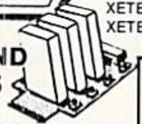
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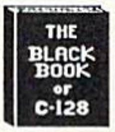
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Compiled by Michael R. Davila

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USE A THREE—SAVE A TREE

The program below illustrates how to achieve paperless debugging by opening output to device 3 (the screen). The program prints 10 address labels spaced for tractor-fed gummed labels. After modification of the program to suit your needs, test with screen output until everything is perfect. Next change D=3 to D=4 in line 10 for a painless conversion to printer output. This technique is ideal with the C-128 80 column screen; however, it also works on the 64 and most other Commodore computers. This method also allows testing disk output onscreen, then changing D=3 to D=8 after debugging.

—Jim Frost
La Mesa, CA

```
•10 D=3:OPEN1,D:REM FOR PRINTER D=4
•20 SP$="[3" "]":REM ADJUST TO  FIT LABEL
S
•30 PRINT#1
•40 REM CENTER TEXT ON LABEL
•50 PRINT#1,SP$"AHOY!"
•60 PRINT#1,SP$"45 WEST 34TH ST SUITE 500
"
•70 PRINT#1,SP$"NEW YORK, NY"
•80 PRINT#1,SP$"1[3"0"]1"
•90 PRINT#1
•100 I=I+1:IFI<10 THEN30
•110 CLOSE1
```

FLIP FLOP

Here's one more way to add some excitement to those monotonous GET and WAIT statements. *Flip Flop* turns your screen inside out and outside in...flippity flop, floppity flip. It'll add some zing to your screen. It works on both the C-64 and the C-128 with a 40 column display. If you're using a C-128 in 128 mode, be sure to change the variable S in line 63000 to 4864 or some other suitable location.

Add *Flip Flop* to your own programs. Whenever you want the flipping and flopping to begin, have your program SYS 49152 for the C-64 or SYS 4864 for the C-128. For example:

```
100 SYS 49152
```

activates *Flip Flop* until a key is pressed. For the C-128,

```
100 SYS 4864
```

does it.

On both computers, the value of the keypress is returned in location 254. If your program is using *Flip Flop* instead of a GET statement, a line such as

```
110 PRINT PEEK(254)
```

tells what key was pressed.

You can activate *Flip Flop* in direct mode, too. As a matter of fact, give yourself a demonstration. List a program, then have some fun. SYS 49152 [RETURN] activates the C-64 version. SYS 4864 [RETURN] works the C-128. Press a key to exit. *Flip Flop* waits until everything is back to normal before exiting, so it might take a second or two after the keypress.

Flip Flop can be relocated by changing S in line 63000. Remember to SYS to the new location if you do change it.

—Buck Childress
Salem, OR

```
•63000 S=49152:REM *** CHANGE S TO 4864 F
OR THE C-128 ***
•63002 REM *** S CAN ALSO BE CHANGED TO R
ELOCATE IN BOTH COMPUTERS ***
•63004 FORJ=STOS+92:READA:POKEJ,A:X=X+A:N
EXTJ
•63006 IFX<>14751THENPRINT"ERROR IN DATA[
3"."]":END
•63008 DATA169,4,162,216,160,0,133,252,13
4,254,132,251
•63010 DATA132,253,169,7,162,219,160,231,
133,100,134,102
•63012 DATA132,99,132,101,160,0,177,99,72
,177,101,72
•63014 DATA177,251,145,99,177,253,145,101
,104,145,253,104
•63016 DATA145,251,162,0,232,208,253,165,
99,208,10,198
•63018 DATA100,198,102,165,100,201,3,240,
16,198,99,198
•63020 DATA101,230,251,230,253,208,205,23
0,252,230,254,208
•63022 DATA199,32,228,255,240,166,133,254
,96
```

80 COLUMN TEXT DUMP

Do you ever create a screen in 80 columns that you'd like to print to the printer, but can't? Here is what the doctor prescribed: an 80 column text dump that will work on all Commodore and commercial printers. The program is written entirely in BASIC 7.0, except for a short ML routine found in the *128 Programmer's Reference Guide*. The program only prints a Low-Res Text screen, which includes



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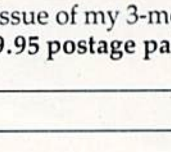
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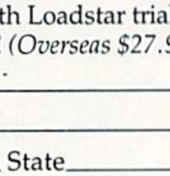
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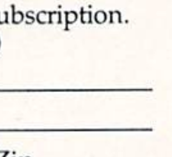
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all the characters, and even the Commodore Low-Res Graphics; and only one mode, Uppercase/Graphics, although you can change OPEN 4,4 (line 9010) to OPEN 4,4,7 which will print the Upper/Lowercase set.

When entering this program, use it as a subroutine. The first couple of lines demonstrate the program, while the main program is from 9000-9040. When the program is running, press [LINE FEED] to print the screen. Have fun!

—Richard C. Jones
Throop, PA

```
•5 FAST
•10 PRINT"[CLEAR] PRESS [LINE FEED] TO DU
 MP SCREEN, ANYTHING ELSE EXITS":SLEEP3
•15 SCNCLR
•20 R=0:DO:R=R+1:PRINT"* THIS IS AN 80 CO
 LUMN TEXT DUMP DEMO MADE BY RICH JONES U
 SING BASIC AND ML. ";:LOOP UNTIL R=25
•25 GETKEYK$:IF K$=CHR$(10)THEN GOSUB9000
•30 END
•8999 END
•9000 VI=DEC("1800"):VO=DEC("180C"):BANK1
 5
•9005 READA$:DO UNTIL A$="END":POKE VI+I,
 DEC(A$):I=I+1:READA$:LOOP
•9010 OPEN 4,4:R=0:DO:AD=R*80
•9015 DO:SYS VO,AD/256,18:SYS VO,AD AND 2
 55,19:SYS VI,,31
•9020 RREG A:A=A+((A<32)*-64+(A>95)*-64+(
 A>63 AND A<96)*-32)
•9025 R$=R$+CHR$(A):AD=AD+1:LOOP UNTIL AD
 =R*80+80
•9030 PRINT#4,R$:R$="":R=R+1:LOOP UNTIL R
 =25:CLOSE4:RETURN
•9035 DATA 8E,00,D6,2C,00,D6,10,FB,AD,01,
 D6,60
•9040 DATA 8E,00,D6,2C,00,D6,10,FB,8D,01,
 D6,60,END
```

INPUT ROUTINE

I have noticed that in many computer magazines readers have needed a controlled input routine. I have used this routine on several computers over the years. This version of the routine was written for a Commodore 64, but it would not be very difficult to modify it to another computer's BASIC.

—Michael D. Stemle
Mansfield, OH

```
•10 PRINT"[CLEAR]PLEASE SEE DOCUMENTAION"
•20 PRINT"IN MAGAZINE."
•30 END
•1000 REM ------------------------------
•1010 REM   SET V TO THE MAX NO. CHARS
•1020 REM   TO BE ALLOWED TO BE INPUT
•1030 REM
•1040 REM   V$ WILL CONTAIN THE TEXT
•1050 REM   ENTERED
•1060 REM ------------------------------
•1070 V$="":B$=CHR$(157)+" "+CHR$(157)
•1080 GET A$:IF A$="" THEN 1080
•1090 A=ASC(A$):IF A=13 THEN RETURN
•1100 IF A<>20 THEN 1130
```



Reader Service No. 273



Reader Service No. 274

```
·1110 IF LEN(V$)>0 THEN V$=LEFT$(V$,LEN(V
 $)-1):PRINT B$;
·1120 GOTO 1080
·1130 IF (A<32) OR ((A>127) AND (A<160))
 OR (A>255) THEN 1080
·1140 IF LEN(V$)=>V THEN 1080
·1150 V$=V$+A$:PRINT A$;
·1160 IF A=34 THEN POKE 212,0
·1170 GOTO 1080
```

PULSATOR

Pulsator for the C-64 creates a pulsating effect with the high resolution screen located at 8192/$2000.

There are two modes to this program. When you use the fade out feature, your hi-res screen will fade out until the screen is blank. It is stored in memory starting at 32768/$8000. To fade in the screen, use the number one after the SYS command and comma. The following line creates a pulsating effect:

```
10 FORI=0TO1:SYS your starting address,I
:NEXTI:GOTO10
```

I designed two modes to let you design your own introductions to your hi-res screens. For example, if you load your screen into 32768/$8000, you can use the fade in feature to display this screen. Then, while the screen is being displayed, you can load another one into memory and display it. This could be useful for a slide show effect.

Note: This program does not enable the high resolution mode for you.

—Michael Jaecks
Alamogordo, NM

```
·10 REM PULSATOR BY MICHAEL JAECKS
·20 S=49152:REM CHANGE TO RELOCATE ML
·30 FOR I=0TO107:READA:POKES+I,A:B=B+A:NE
XTI
·40 IFB<>15963THENPRINT"ERROR IN DATA!":E
ND
·50 HI=INT((S+99)/256):POKES+36,S+99-HI*2
56:POKES+37,HI
·60 HI=INT((S+107)/256):POKES+69,S+107-HI
*256:POKES+70,HI
·70 PRINT:PRINT"SYNTAX: ";S;CHR$(157);",0
=FADE OUT OR 1=FADE IN"
·80 PRINT"SPEED:  POKE";S+107;CHR$(157);"
,0-255 (INITIALLY 10)"
·100 DATA 32,155,183,134,254,162,0,169,0
·110 DATA 133,250,133,252,138,72,162,32
·120 DATA 160,128,165,254,208,6,134,251
·130 DATA 132,253,240,4,134,253,132,251
·140 DATA 104,170,188,99,192,169,64,197
·150 DATA 250,208,10,169,63,197,251,240
·160 DATA 43,197,253,240,39,177,250,145
·170 DATA 252,165,254,208,4,169,0,145
·180 DATA 250,138,72,174,107,192,202,208
·190 DATA 253,104,170,165,250,24,105,8
·200 DATA 133,250,133,252,144,207,230
·210 DATA 251,230,253,208,201,232,224,8
·220 DATA 208,165,96,0,4,2,6,1,5,3,7,10
```

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TOPS IN AMIGA ENTERTAINMENT

A Baker's Dozen of 1987's Best Entertainment Programs

By Arnie Katz and the editors of *Ahoy!*

Featured This Month:

In its first full year in the marketplace, the Amiga has begun to build up a truly impressive catalogue of entertainment software. Beginning this month and continuing on an annual basis, the editors who cover Amiga entertainment for *Ahoy!* will survey the year's output of games and recreations and pick the best.

There were fewer than half as many new games introduced for the Amiga as for the Commodore 64/128. Fortunately, impressive quality makes the somewhat restricted selections easier to bear.

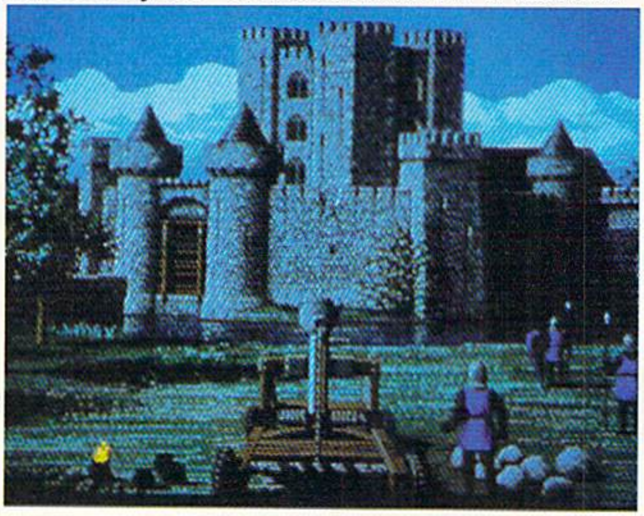
The judges, as usual, crave the indulgence of those whose favorites didn't quite make our admittedly short list. In a similar vein, regrets are extended to those publishers whose products did not reach our office in time for inclusion in this year's survey of the Amiga entertainment scene. As fans of the old Brooklyn Dodgers shouted each October, "Wait till next year!"

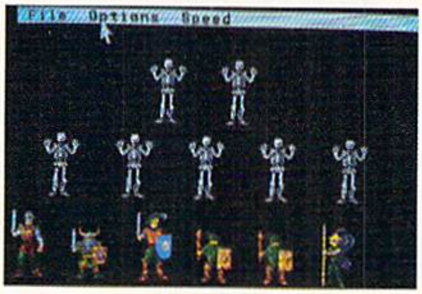
Here, then, are the 13 best Amiga entertainment programs of 1987, presented in alphabetical order:

Chris Crawford's *Balance of Power* (Mindscape) makes such good use of artificial intelligence that it is actually more fun to play against the computer than a human opponent. Players painlessly absorb knowledge about the world political situation while wrestling with the problems of leading the Free World in the nuclear age.

Chessmaster 2000 (Software Toolworks) really gives the machine's audiovisual capabilities a workout. Move over, *Sargon;* flexibility and ease of use have made *Chessmaster 2000* the new king of the 64-square world.

Defender of the Crown (Mindscape) was the first of Master Design Software's Cinemaware line, and many feel it is still the best. Lush animated artwork and the best sound yet heard on an Amiga game enrich this adventure set in England in the period after the Norman Conquest.







Top to bottom:

Defender of the Crown: ***finest Amiga sound.*** ***READER SERVICE NO. 226***

Phantasie III: ***best in series.*** ***READER SERVICE NO. 227***

Balance of Power: ***good use of AI.*** ***READER SERVICE NO. 228***

Earl Weaver Baseball (Electronic Arts) is the first statistical baseball simulation written expressly for the Amiga. This hardball title, which can also be played as an action contest, is loaded with extra features. For example, a manager who can't figure out what to do next can ask Weaver for advice!

Flight Simulator I (SubLOGIC) is a classic computer simulator that has never looked or played better. The scenery, in particular, benefits greatly from the Amiga's astounding graphics. Designer Bruce Artwick's flight simulator is deservedly one of the best selling games of all time.

Marble Madness (Electronic Arts) is a faithful home version of the coin-op hit. The sound and graphics are the best found in any Amiga action game.

The Pawn (Rainbird/Firebird Licensees) introduced a superb parser which understands more words and context than any other rival systems. Exceptional artwork, accessed through pull-down windows, adds visual excitement to this text-based tale of Kerovnia.

The third title in Doug Wood's graphics adventure trilogy, *Phantasie III: Wrath of Nikademis* (Strategic Sim-



Roadwar 2000: *hard driving action.*
READER SERVICE NO. 233



Play **Shanghai** *and an hour later....*
READER SERVICE NO. 234

ulations), is the best game in the series. The ability to move characters in a party independently and the more detailed wound system are two of many

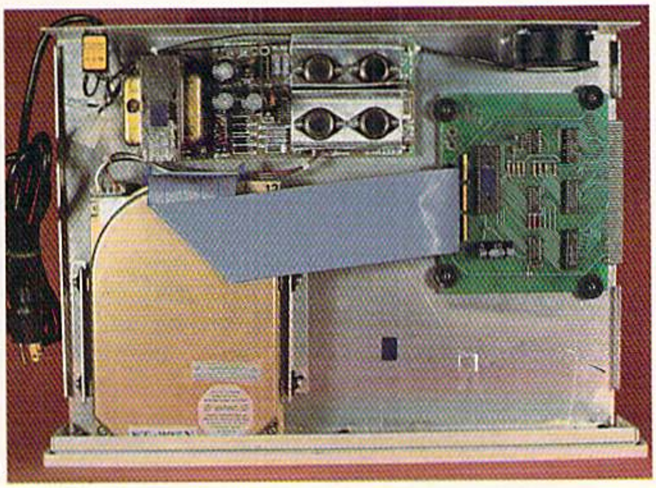
A20 (20 Meg Hard Drive)
Comp-U-Save
Amiga 1000
Hardware: $785

As anyone who has used an Amiga for more than 10 minutes can tell you, AmigaDOS is a disk-based operating system. In fact AmigaDOS is so intimately involved with external storage that all its commands must be loaded in prior to execution. By contrast, most other disk operating systems have a small selection of often-used commands which are memory resident. It is for this reason we strongly recommend the purchase of a second disk drive for all Amiga users.

Although Amiga disks are a mere 3½" in diameter, they each store a respectable 880 kilobytes of data. Nevertheless, for many Amigas, the amount of online RAM will exceed the capacity of available disk storage. This is in sharp contrast to the rule of thumb for early microcomputer enthusiasts, which recommended a disk capacity of five to six times the available RAM. This was fine in those bygone days when RAM was measured in four kilobyte increments and 64 kilobytes was virtually unheard of. For the Amiga, the basic unit of RAM is the megabyte or some large fraction thereof.

A popular alternative to additional floppy disk storage is the hard disk drive. Hard drives are characterized by a rigid, rapidly spinning, magnetically coated disk whose storage capacity is measured in tens of megabytes. Ten megabytes, even by today's standards, is a respectable amount of online storage. Most microcomputer hard disks are 5¼" in diameter, with 3½" units starting to appear. They achieve their massive storage capacity by a combination of high mechanical precision and the total isolation of the storage medium from the environment.

In fact the read/write heads in the hard disk drive never make direct physical contact with the magnetic media. Instead the heads float a few millionths of an inch above the data platter on a cushion of air. The inadvertent contact



The A20 is built around a Seagate ST225N SCSI hard drive module (bottom) with its own power supply (top) and Amiga to SCSI interface (right). READER SERVICE NO. 235

improvements Wood made in his already excellent system.

Portal (Activision) is the year's most innovative entertainment product for the Amiga. This electronic science fiction novel tells a story which could not have been presented in any comparable form without the computer.

Roadwar 2000 (Strategic Simulations) concerns vehicular combat in a post-catastrophe United States. What makes it fascinating is that the fighting is merely a means toward achieving a larger goal. To win *Roadwar 2000*, the player must find the scientists who can save the shattered remnants of the country before invaders, brigands, and disease destroy it.

No abstract strategy game has captivated computerists like *Shanghai* (Activision). Clearing the colorful playfields one pair of matching tiles at a time has become an addiction for thousands. Play *Shanghai* once, and you'll know why.

Space Quest (Sierra On Line), written by Two Guys from Andromeda, applies to science fiction the interactive graphics adventure system perfected in the *King's Quest* series. The zany coauthors maintain a light tone through this interstellar romp.

Starglider (Rainbird/Firebird Licensees) is science fictional, too, but it emphasizes piloting and shooting action. The glowing linework and unusual airbrush effects of *Starglider's* illustrations make it a visual delight.

The best part of surveying the Amiga entertainment software of 1987 is knowing how much better 1988 will be. Increased understanding of the Amiga's capabilities will lead to recreational software that sets new standards for sound, graphics, and play value. ☐

---

of a head with the platter, referred to as a head crash, results in the loss of data. The drive unit must be sealed from contact with the atmosphere, as even the most minute dust particle can crash the head. Unlike a floppy disk, the hard disk platter is fixed in place and is not readily changeable.

In addition to its larger storage capacity, the hard disk drive enjoys a substantial speed advantage over its flexible brethren. When we consider the storage and speed improvements we can begin to appreciate the advantages of the hard drive. For the Amiga the large disk capacity is of particular importance. Most users rapidly discover that the 880K capacity of the floppy disk is insufficient space for AmigaDOS, fonts, printer drivers, and the utilities which inevitably become part of the operating environment.

The A20, manufactured by Phoenix Electronics, is the first hard drive to come into our possession. Although Phoenix Electronics has been serving the Commodore market for some time with a substantial line of replacement power supplies, you may not have seen their name. Phoenix is primarily an original equipment manufacturer (OEM) which prefers to market their product through third party distributors. In this case it is Comp-U-Save who will sell you the drive and will stand behind its one year warranty. Such are the intricacies of the free enterprise system.

The Hard Drive's Hardware

This hard drive comes in an all-metal, 3" high enclosure whose length, width, and color are a reasonable match for the Amiga 1000. In point of fact the drive is designed to sit right on top of the Amiga. Connection to the Amiga's 86 pin expansion port is via a U-shaped "staple" which also provides a straight, unbuffered pass through the expansion bus. All three of the staple's edge card connectors are of the female persuasion. This means that an additional printed circuit extension card will be required to utilize the pass through with devices which are normally designed to mate with the 86 contact printed circuit edge card connector on the Amiga.

Inside the vented metal enclosure we found a Seagate 225N hard drive module equipped with a small computer systems interface (SCSI, usually pronounced scuzzy). The front panel of the 225N is set through the front of the enclosure. Drive activity is indicated by a flickering LED set in this front panel. The SCSI port is interfaced to the Amiga's expansion port through a custom adapter designed by Phoenix Electronics. According to Phoenix, they are licensing the programmed array logic (PAL) chips for the adapter from C Ltd. These are the same PALs used by C Ltd in their own hard drive.

The hard drive is equipped with its own power supply which has sufficient capacity to power the drive and an external memory board. It should be possible to modify the supplied pass through so that an external RAM card would obtain its power from the power supply inside the hard drive. We did not do this modification for this review. The case is ventilated by a small fan which sucks air in from the rear and expels it through ventilation slots on the left side. The hard drive components occupy about half of the volume inside the enclosure.

The Setup

We set up our hard drive on a system consisting of an Amiga 1000 with one 5¼" and two 3½" floppy drives, a half megabyte of internal RAM, and an aMega 1 megabyte external RAM

A20 DISK PERFORMANCE TEST RESULTS

	DHO:	DF1:	RAM:
Total Test Time in Seconds	447	1300	182
File Creations Per Second	6	0	5
File Deletions Per Second	10	1	10
Directory Scan (Entries Per Second)	50	36	5
Seek+Read Per Second	49	17	49
Read Speed Bytes Per Second			
512 Byte Buffer	21487	11599	187245
4096 Byte Buffer	24049	12423	655360
8192 Byte Buffer	24730	12365	655360
32768 Byte Buffer	25206	12365	873813
Write Speed Bytes Per Second			
512 Byte Buffer	12483	4993	131072
4096 Byte Buffer	14979	5110	238312
8192 Byte Buffer	15511	5150	262144
32768 Byte Buffer	15420	5150	291271

card by C Ltd. This arrangement violates Commodore's specifications with regard to the loading of the expansion bus. Much to our surprise, the entire setup functioned flawlessly.

The Performance Test

The speed at which the disk drives transfer data is important in a disk-based operating system. In this regard AmigaDOS' floppy disk activity has not earned a reputation for high speed. The use of a hard drive does improve matters substantially. We ran several tests to measure the relative performance of the Comp-U-Save drive as compared to other systems. The first series of tests consisted of copying the "C" directory from both hard and soft disks to RAM and back again. In our case the "C" directory contained 53 files and occupied 453 disk blocks. The results are summarized in the following table:

Copy DHO:C To RAM:	All	22 secs.
Copy RAM: To DHO:Temp	All	30 secs.
Copy DFO:C To RAM:	All	51 secs.
Copy RAM: To DF1:Temp	All	173 secs.
Delete DHO:Temp/#?		10 secs.
Delete DF1:Temp/#?		40 secs.

Direct comparison of these test results with similar data published for other drives should be done with caution. Disk drive speed benchmarks are affected by a variety of system parameters including buffer size, disk contents, the time of day, and the state of mind of the system operator. In general, speed tests should be viewed as a measure of the relative performance of similar systems. For the above tests the hard drive had about one megabyte of data before we started. The source floppy (DFO:) was a typical Workbench disk and the destination floppy (DF1:) was empty. The default number of disk buffers was used. We also ran the widely used disk performance test by Rick Spanbauer as found on Fred Fish disk number 48. The results were as shown in the table on this page.

All tests were done with the default number of disk buffers. The test of DHO: was done with about two megabytes of data on the disk. The test of DF1: was with a freshly formatted disk. Perhaps the most significant result of these tests is contained in the first line of the table, which shows the total time required for the complete series of tests on each device.

The Software

Very little is provided in terms of software support and very little is required. The Comp-U-Save hard disk comes with a copy of Workbench 1.2 on a floppy disk and on the hard drive itself. There are two files of importance to the system. The first is the "hard-disk.device" file located in the "devs" directory. This file should be copied to the "devs" directory of all your boot disks, as it contains the operating code which controls the hard disk drive. The second is the "mountlist" list file which is also contained in the "devs" directory. This file defines the structure of the hard disk in terms of how its storage capacity will be organized. The default arrangement, DHO:, sets up the hard drive as a single unit with a capacity of 21,307,392 bytes.

You should also note the "startup-sequence" file in the "s" directory for an example of how to assign control of the system to the hard drive after booting up. This lets you remove the Workbench disk from DFO: after the system is initialized. Note that the contents of the provided "mountlist" file should be appended to your own "mountlist" file if you are already adding a device to your system such as a 5.25" floppy drive. The AmigaDOS Append command can be used to combine the files.

The accompanying manual contains brief setup and installation instructions, listings of the mountlist files, and the drive's specifications. We also received a copy of the Seagate Universal Installation Handbook. Examination of the latter manual revealed that the ST225N does not have an automatic read/write head parking function at power off. The parking function moves the read/write head to an unused portion of the disk. This is to prevent loss of data if the head contacts the disk surface while the drive is being transported. The lack of an auto-park function mandates that the task be done via user software. We pointed out this deficiency to Phoenix, who will rectify it by providing the utility for the drive.

Conclusion

The Comp-U-Save hard drive performed well in our tests. In comparison to previously published results for similar units, it would appear to be among the faster units which are presently available. It is also among the least expensive of the Amiga hard drives.

Comp-U-Save, 414 Maple Ave., Dept. F, Westbury, NY 11590 (phone: in NY 516-997-6707; rest of USA 800-356-9997). *—Morton Kevelson*

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Reader Service No. 276

THE INS AND OUTS OF THE C-64/128 EXPANSION PORT, PART II

Where We Apply Our Hard-Earned Knowledge to Expand EPROM Memory

By Morton Kevelson

Last month we had examined the expansion port in sufficient detail to permit us to go ahead with the construction of a typical ROM cartridge. Since the ROM cartridge is one of the simplest types of add-ons which utilize most of the expansion port's lines, it will be instructive to examine it in detail. We will also show how the basic design can be easily expanded upon to utilize the large capacity, low cost ROMs which are now available.

WARNING: In these projects, as in all construction projects, the users must assume all responsibility for any damage which may be inflicted upon themselves or their equipment. Incorrect application of the following suggestions could result in permanent disability to your equipment. These discussions are for informational purposes only!

The accompanying table (see page 61) shows the connections to the expansion port for an eight kilobyte cartridge using a 2764 EPROM mapped into the address range of $8000 to $9FFF (32768 to 40959). The majority of commercial game cartridges are of this type. The EPROM's pin designations correspond to those used by Intel in their Memory Components Handbook. Other manufacturers may use slightly different designations. For example the data lines, D0- D7, may be called output lines, 01-08. Regardless of their labels the pin functions of all 2764 EPROMs should be the same.

In addition to the connections shown in the table, contact 9 on the expansion port should also be connected to ground (contacts 1, 22, A, or Z). When the C-64 or C-128 is powered up with this cartridge installed, the RAM in address range $8000 to $9FFF (32768 to 40959) will automatically be replaced by the ROM in the external cartridge. We have also provided a schematic representation of the table for the 2764 EPROM (Figure 1). Note that we have shown the 2764 as viewed from the top. The EPROM may be properly oriented by noting the position of the notch at one end of the chip. Some chip manufacturers may replace this notch with a small dimple or dot next to pin number 1.

With the proper code this cartridge will autostart. In this case the first two bytes in the ROM must contain the program startup address. The next two bytes should contain the address to go to when the RESTORE key is pressed and the next five bytes contain the characters CBM80 ($C3, $C2, $CD, $38, $30). Note that the first three bytes of this sequence have their high bits set. Of course the initiating program code for autostarting cartridges must be written in machine language. How-

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ever, it is possible to write the bulk of the program in BASIC.

With a slight modification to the above table it is possible to add a second EPROM which will appear in the address range of $A000 to $BFFF (40960 to 49151). This will replace the BASIC ROM in the C-64. One application for the second ROM would be to modify the C-64's BASIC ROM and program it into an EPROM which would then be available on power up. Simply wire up a second EPROM as before with pins 20 and 22 on the EPROM connected to contact B (ROMH) on the expansion port (Figure 2). Contact 8 (GAME) will also have to be grounded along with contact 9 (EXROM).

An even simpler approach to the same application would be to substitute a 27128 EPROM for the 2764. The 27128 has a capacity of 128 kilobits (16 kilobytes), double that of the 2764. It has been designed to be pin compatible with the 2764 so that existing designs will require minimal modification. The only difference between the two chips is that pin 26, which was not used on the 2764, becomes address line A13. Of course it only requires one additional address bit to double the capacity of a memory chip. The quickest way to configure the 27128 as the 16K cartridge described above is to connect pin 26 (A13) to cartridge port contact B (ROMH) (Figure 3). Note that ROMH is active low, which means that it will be a logical zero when address range $A000 to $BFFF (40960 to 49151) is being accessed. To get the EPROM to function properly, simply reverse the programming of the two eight kilobyte blocks. Thus the code for address range $8000 to $9FFF (32768 to 40959) will be placed into the EPROM's address range of 8192 to 16384.

An alternative use for the larger capacity EPROM is to treat the 16 kilobytes as two 8 kilobyte program blocks. In this case a 27128 EPROM has the capacity to store two 8 kilobyte programs. The switching arrangement is simple, requiring minimal modification of the original design. We have shown a manual method which uses a miniature switch to select the EPROM bank (Figure 4). Closing the switch will select the EPROM's first 8 kilobytes. Opening the switch selects the second 8 kilobyte bank.

The same method can be extended to the 27256 and 27512 EPROMs. These have a capacity of 32 kilobytes and 64 kilobytes respectively. In this case up to four 8 kilobyte blocks can be placed into the 27256 and as many as eight blocks into the 27512. Bank switching the 27256 will require the use of two miniature switches (Figure 5) and the use of three switches (Figure 6) for the 27512.

Although these are rather simple projects, there are still a large number of electrical connections which must be made. Prefabricated cartridge boards are readily available at minimal cost. For example, the PCC-2 from Jason-Ranheim is a prefabricated expansion port printed circuit board which can accommodate two 2764 EPROMs as described in our second example. The board, complete with sockets for the ROMs, is only $5.95. The board also has traces which may be modified to accommodate 27128 (16 kilobytes), 27256 (32 kilobytes), and 27512 (64 kilobyte) EPROMs.

An alternative to the hardware switches we have described is to use a set of soft switches for banking the EPROM. In this case the manually operated mechanical switch is replaced

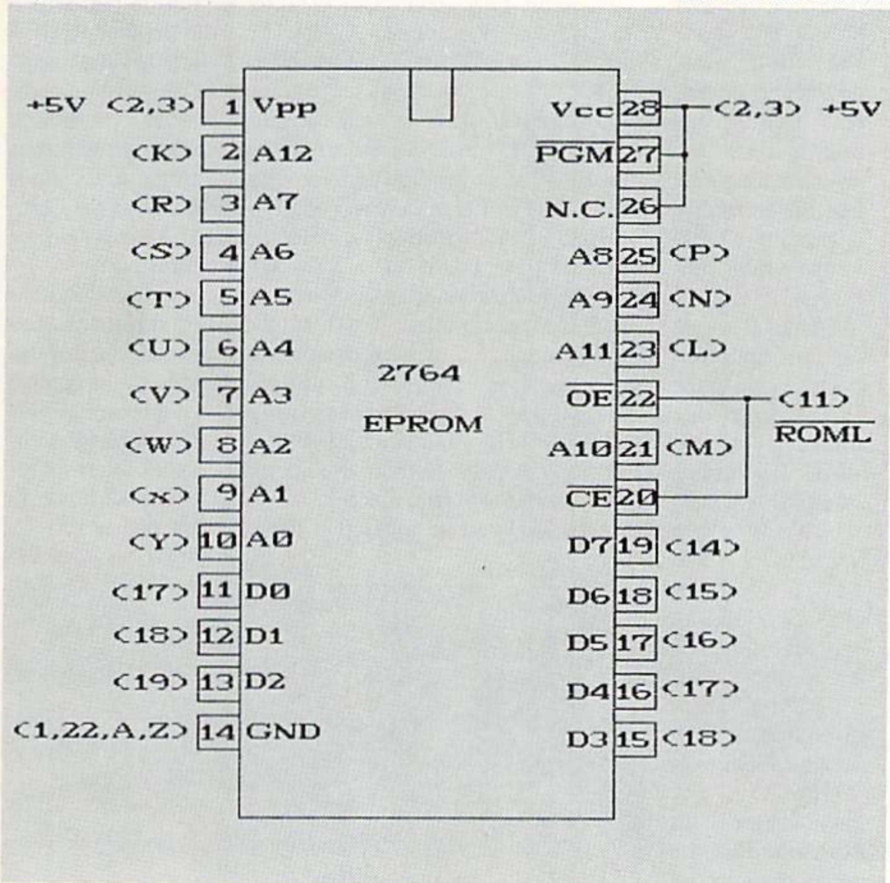


Figure 1: Connection to C-64 Cartridge Port

WIRING TABLE FOR 8K EPROM AT $8000-$9FFF

Cartridge Port		EPROM	
ID	Pin No.	Pin No.	ID
GND	1,22,A,Z	14	GND
+5V	2,3	1	Vpp
"	"	26	N.C.
"	"	27	PGM
"	"	28	Vcc
ROML	11	20	CE
"	"	22	OE
D7	14	19	D7
D6	15	18	D6
D5	16	17	D5
D4	17	16	D4
D3	18	15	D3
D2	19	13	D2
D1	18	12	D1
D0	17	11	D0
A12	K	2	A12
A11	L	23	A11
A10	M	21	A10
A9	N	24	A9
A8	P	25	A8
A7	R	3	A7
A6	S	4	A6
A5	T	5	A5
A4	U	6	A4
A3	V	7	A3
A2	W	8	A2
A1	X	9	A1
A0	Y	10	A0

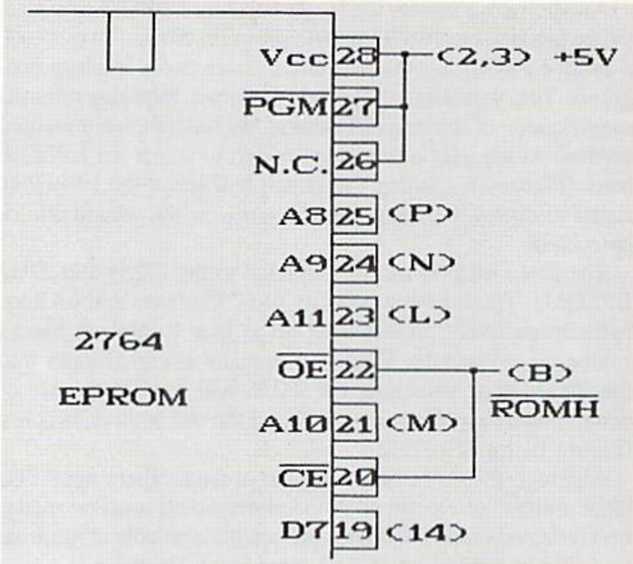


Figure 2: Modification for Cartridge in $A000 Block

by an electrically operated electronic switch in the form of an electronic switch or latching circuit. The soft switches appear as one or two locations in the C-64's I/O address space. The switches are set or reset by writing the appropriate data to the selected address. The advantage of this approach is that the EPROMs may be banked under program control. This allows the EPROMs to be used for extended program storage. Since the EPROMs are simply memory, any programs or data can be instantly available. The only disadvantage of the soft switch approach is that the switch setting may be inadvertently changed by a write to the wrong address.

For an example of this approach we refer you to the PCC4 cartridge board ($17.95) from Jason-Ranheim. This board, which fits into a standard sized PCCH2 C-64 cartridge case ($2.25), will accommodate up to four EPROMs. These EPROMs may be 2764s, 27128s, or 27256s in any combination. This gives the PCC4 a total capacity of 128 kilobytes! The onboard soft

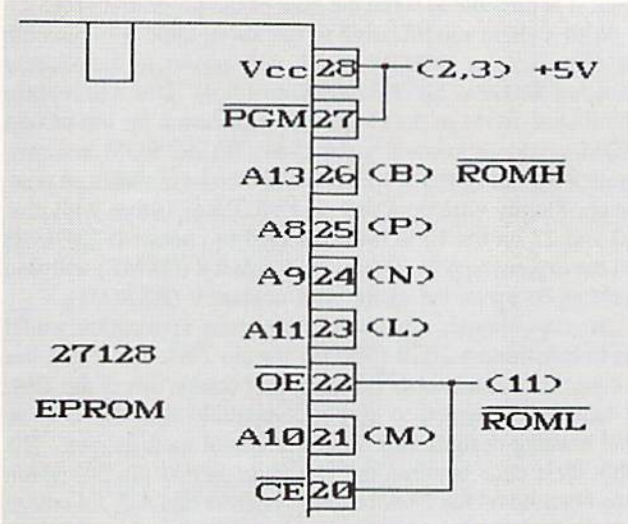


Figure 3: Modification for 27128 in $8000 to $BFFF Block

switches let you bank in the ROM in 8 kilobyte increments or bank out the EPROMs entirely. Of course all these projects require some means of programming the EPROMs. The Promenade ($99.95) from Jason-Ranheim can handle all of the EPROMs we have mentioned plus many others. For a detailed discussion of EPROM programming, along with a review of the Promenade, see *PROM Programming Made Easy* in the July 1985 issue.

There are only eight contacts on the expansion port which we have not yet examined. Contact C is the popular RESET line. Momentarily connecting this contact to ground and releasing it will cause the computer to reset to the power on condition. Note that the reset sequence starts when the connection is released. In terms of software the microprocessor will start executing the code at the address which is stored in locations $FFFC and FFFD (65532 and 65533). In the case of the Commodore 64 this address is $FCE2 (64738). A reset may be executed from BASIC by a SYS 64738 command.

Contact D is connected directly to the microprocessor's non-maskable interrupt line (NMI). If the NMI line is momentarily grounded, the microprocessor will stop whatever it is doing at the completion of the current instruction and execute the NMI routine whose address is stored in addresses $FFFA and $FFFB (65530 and 65531). An NMI cannot be ignored. Contact 4 is tied directly to the microprocessor's interrupt request line (IRQ). This functions similarly to the NMI except that the IRQ can be ignored if the interrupt flag is set.

Continued on page 98

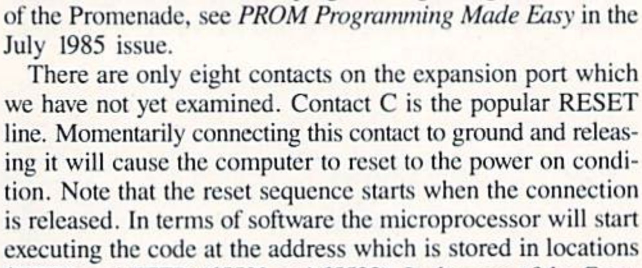


Figure 4:
Modification for Bank Switching a 27128 EPROM
S1 Closed = Bottom 8K S1 Open = Top 8K

REVIEWS

THE ADVANCED OCP ART STUDIO
Firebird Licensees, Inc.
Commodore 64
Price: $39.95

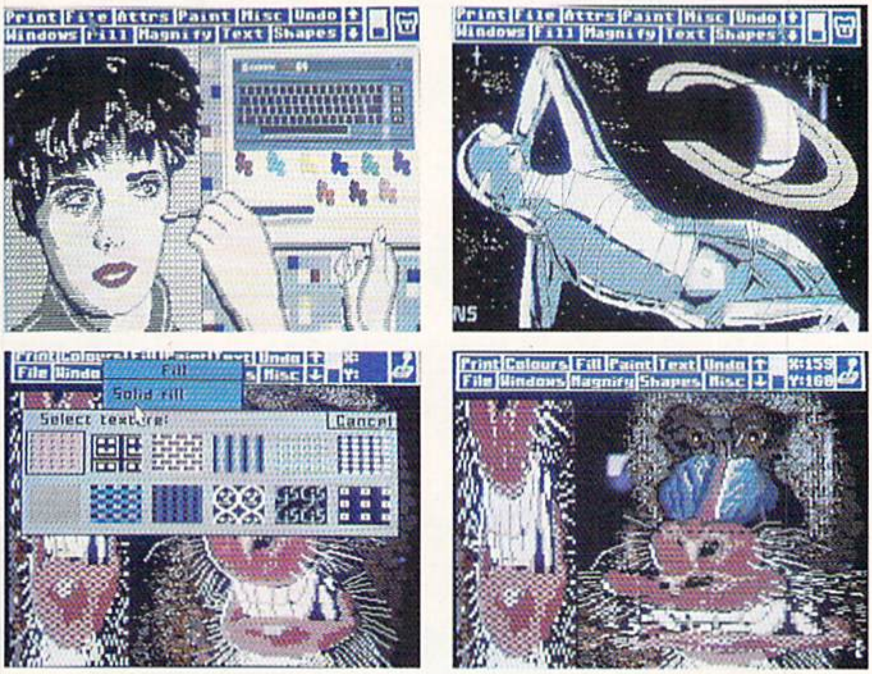
It has been some time since we have examined a dedicated graphics package for the C-64. Part of the reason is that the programs introduced early in the history of the C-64 did a satisfactory job for most users. In fact, the majority of our *Art Gallery* submissions were done with *Koala* or *DOODLE!*, both of which have been around for nearly as long as the C-64.

We were pleasantly surprised to see a new entry in the C-64 graphic market. *The Advanced OCP Art Studio* from Rainbird Software is a British product being distributed here by Firebird Licensees, Inc. When we opened the package we found two sets of program disks and manuals. A careful examination revealed that we did indeed have two different programs and not merely a duplicate set. We were a bit confused by the nomenclature which was chosen for the supplied program disks. One was identified as *The OCP Art Studio* and the other was labeled *The Advanced OCP Art Studio.*

We shortly realized that the package actually did contain two different programs. The disk labeled *The OCP Art Studio* contained a graphics program which operated in the C-64's high resolution display mode. The program on the other disk, labeled *Advanced OCP Art Studio*, functioned in the multicolor display mode. To avoid further confusion during the remainder of this review we will refer to these programs as the hi-res *Art Studio* and the multicolor *Art Studio* respectively. We will continue to call the entire package *The Advanced OCP Art Studio* as shown on the box.

The hi-res *Art Studio* utilizes the C-64's high-resolution graphic bit map as its canvas. In this mode the C-64's screen display consists of 320 horizontal pixels by 200 vertical pixels. All sixteen colors may be displayed in high resolution mode; however, there is a limitation whereby only two colors may be used in an eight pixel square character cell.

PHOTOS: MORTON KEVELSON



Top: screens created with the hi-res Art Studio. *Bottom: the multicolor* Art Studio's *built-in brushes and windows.* *READER SERVICE NO. 284*

The multicolor *Art Studio* manipulates the C-64's multicolor graphic bit map display. In this mode the C-64 screen display consists of 160 horizontal pixels by 200 vertical pixels. The use of color in the multicolor mode is a bit more flexible than in the high-resolution mode. Each four by eight pixel character cell may contain any three colors plus a common screen background color. The tradeoff is in the loss of horizontal screen resolution. Note that a multicolor pixel is twice as wide as a high resolution pixel. For additional details on the C-64's bit map graphics, refer to the tutorial on this subject in the July 1987 issue.

Operating Features

Since the versions of *The Advanced OCP Art Studio* are very similar, we will describe them simultaneously, referring to them as hi-res and multicolor, while noting the differences as they occur. The operation of the package is based upon the windows, icons, and menus type of user interface. The top three character rows, or 24 pixels, are occupied by the main menu bar. The missing part of the bit map can be scrolled up, allowing the entire bit map to be utilized. The menus can be turned off to inspect the entire image: however, the image cannot be manipulated in view mode. The menu bar of the multicolor *Art Studio* also includes the bit map coordinates of the current cursor position.

The desired operation is selected from the menus, after which the bit map manipulation is performed. All changes to the bit map which were done between menu selection may be completely cancelled by using the UNDO feature on the main menu.

The comfort and response of the input device is an important factor in the overall performance of a computer graphics package. *The Advanced OCP Art Studio* supports a variety of input devices. The user may interface with the package via the keyboard, joystick, mouse, or Koala pad. Input device selection is via the space bar and the Commodore key. An icon at the right end of the menu indicates the currently active device. Both joystick ports are continuously active, supporting the rapid switching between two devices. Of course some operations require the use of a particular device such as the keyboard for text. Most operations will accept input from any of the supported devices.

If you happen to have a Koala pad you will find that the package works very well with it. The results with the Animation Station from Suncom were nearly as good. The only problem with the latter device was the tendency for the cursor to jump to the top of the screen when the stylus was lifted from the pad. The solution was to release the pad's pushbutton before lifting the stylus. We were surprised at how well the pad worked with the hi-res *Art Studio*, in that it does not have sufficient resolution for the 320 horizontal pixels of the high resolution display. The Koala pad was also the only device which would only work in Port 1.

The supported mouse is the 1350, or the 1351 in trackball mode. The proportional mode of the 1351 mouse is not supported. We found that an Atari style trackball worked very well in mouse mode. Note that the joystick and the mouse/trackball send similar signals to the computer. The selection of input device adjusts the response time of the program to better accommodate the characteristics of the device. In the multicolor *Art Studio* it is possible to adjust the mouse response speed. When using a joystick we found it convenient to take advantage of this option by switching between the mouse and joystick input devices.

Although the package was supplied on disk, the file menus include options for tape storage. File operations are not limited to the storage and retrieval of full screen images. The multicolor *Art Studio* includes the ability to save fonts, patterns, and windows. The hi-res *Art Studio* only supports file operations for full bit maps and fonts. The table shows the file formats for full bit maps as used by the package.

ART STUDIO FILE FORMATS

	Hi-Res	Multicolor
Bit Map	\$2000-\$3F3F 8192-16191	\$2000-\$3F3F 8192-16191
Video Matrix	\$3F40-\$4327 16192-17191	\$3F40-\$4327 16192-17191
Border	\$4328 17192	\$4328 17192
Background		\$4329 17193
Color Memory		\$432A-\$4711 17194-18193

One of the most powerful features of both programs is the ability to manipulate sections of the bit map or windows. Any section of the image, including the entire screen, may be defined as a window. Once defined, a window may be flipped, rotated in increments of 90, 180, or 270 degrees, rescaled horizontally and vertically, cleared, and cut and pasted. A multiple flag lets the current operation be repeated any number of times. The hi-res *Art Studio* also supports two types of merges with the background, as well as a direct overlay on the existing image. The disk file support for windows in the multicolor *Art Studio* lets you easily create clip art collections.

Color

In view of the differing restrictions placed on color by the C-64's two bit map display modes, it is important to note how each program handles color. The hi-res *Art Studio* provides for independent selection of the foreground and background colors. In addition, either color may be set to transparent. This allows operations to be performed on the bit map without affecting either of the existing foreground or background colors in a character cell.

The multicolor *Art Studio* lets you define an exclusion list and a priority list, each of which may contain up to 15 colors. The exclusion list defines which colors will not be used when performing many operations. For example, adding blue to the exclusion list will prevent the blue parts of a brush from being painted. The priority list effectively lets you define foreground and background colors for the entire picture. For example, placing red at the top of the priority list will fix all red areas of the bit map. The use of the two lists in conjunction with the window feature results in a very powerful way to manipulate the image.

Hardcopy

Both programs offer extensive printer support. The program comes set up for the Commodore MPS-801 printer. This will also work with a dot matrix printer and a graphics interface in emulation mode. A printer setup program is provided which configures the disk to work with an Epson type printer. The user is required to enter the printer's specific control codes for initiating bit map graphics. The setup program prompts you for the data while showing specific examples. The user will need sufficient technical expertise to pick the proper codes from the printer's manual. We managed to get *The Advanced OCP Art Studio* to work with a Gemini 10X after some experimentation.

The program supports several types of printer dumps. The hi-res *Art Studio* will scale the dump from 1 x 1 up to 5 x 5 times the original bit map. The availability of the larger scalings is dependent on the resolution of the printer. The program will also translate colors into a dot pattern gray scale. The dot patterns which are used for the gray scale cannot be adjusted by the user. For Epson type printers, you have the option of using double density mode as well.

The multicolor *Art Studio* generates only gray scale translations of the color image. The multicolor *Art Studio* supports scaling of the printout from 1 x 1 up to 16 x 16 with the independent setting of the horizontal and vertical scale factors. The actual range of available scale factors depends on the resolution of your printer or the number of dots on a printed line. Note that if you use roll paper, or if you ignore the perforations, there is no limit on vertical scaling. Printouts may be left justified, right justified, or centered.

Text

Both programs support either left to right or top to bottom placement of text on the image. The multicolor *Art Studio* also supports right to left and bottom to top placement of text in regular, bold, or italic. The hi-res *Art Studio* does not support italic text. The scaling of text ranges from one to three with the independent setting of the horizontal and vertical scale factors.

A well-designed font editor is included with both programs. The character sets used by the package may contain up to 91 characters. The editors display the entire set in normal size. Three characters are presented enlarged, of which one may be edited. The character to be edited may be selected by scrolling through the set or by clicking on a character in the nor-

mal size display. Editing operations include the dot by dot creation and modification of the individual characters. Characters may also be inverted, flipped, rotated, scrolled to the right, or scrolled down. In the multicolor *Art Studio* characters may also be scrolled up or to the left. These additional operations make it easier to experiment and to correct for inadvertent overshoot.

The inclusion of a versatile text mode combined with the scalable printer dumps makes *The Advanced OCP Art Studio* a useful tool for the creation of posters or signs.

Brushes and Patterns

In addition to a selection of variously sized and shaped paint brushes there is a collection of 12 built-in patterns in the multicolor *Art Studio* and 32 built-in textures in the hi-res *Art Studio*. The patterns may be used for area fill operations. As with the windows, there is more than one way to perform a fill. An interesting technique involves the use of a pattern as a wash. This lets you overlay a second pattern over an area which has already been filled. The technique is difficult to describe, although it can generate very interesting results. Both programs include the ability to edit the patterns or textures, but only the multicolor *Art Studio* lets you save the patterns to disk or tape.

Sketching or painting with any of the 16 available pens is only one of the ways to create an image. The Shapes menu provides for the automatic creation of discrete and continuous lines, rectangles, triangles, circles, and rays. Solid shapes are created by simply filling one of the hollow shapes.

Zoom

As with any pixel-based graphics package, a magnify option is required for detailed editing of the image. The magnify mode may be entered in any of three levels of magnification. Once in magnify mode, the degree of magnification may be changed. Magnify mode may be entered at any point on the bit map screen. Once in magnify mode the image may be scrolled about. Simultaneous viewing of the normal sized and magnified image is not supported. However, in the multicolor *Art Studio* you may momentarily switch to a full screen view to check the progress of your work. The current cursor coordinates are displayed only by the multicolor *Art Studio* while in magnify mode. Both programs offer a switchable grid overlay for two of the magnification levels.

Conclusion

The Advanced OCP Art Studio is an easy to use, high performance bit map graphics package for the C-64. It is particularly attractive as it contains both high-resolution and multicolor programs in the same package. We did find several features in the multicolor *Art Studio* which we felt should have been included in the hi-res *Art Studio* as well.

We expect this package to be a popular choice in the Commodore 64 graphics community. We have already found several support utilities for it on QuantumLink, in particular a *Koala/DOODLE!* to *Art Studio* conversion program.

Firebird Licensees, Inc., Box No. 49, Ramsey, NJ 07446 (phone: 201-444-5700). *—Morton Kevelson*

HOTSHOT PLUS
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C-64/128, Plus/4, VIC 20
Hardware; $99.95

It seems that when the weather begins to cool we find ourselves looking at printer interfaces. Or perhaps it is the arrival of the printer interfaces that brings on the cooler weather. Whatever the case, we once again turn our attention to the link between the Commodore computer and the non-Commodore printer.

Why an Interface

For the rest of the microcomputer world there are two accepted "standards" which define the nature of the connection between the computer and the printer. For the Commodore world there is only one standard, and it is nothing like everybody else's. The most popular connection follows the Centronics standard, which is basically an arrangement which permits the parallel transfer of eight bit data. In reality the Centronics connection is not a standard, although for all practical purposes it has become one. The RS-232 standard, which is a real industry standard, is also widely represented among printers. The RS-232 standard is designed for serial transmission of data one bit at a time. The main application of the RS-232 connection is for telecommunications devices like modems.

The Commodore computers and operating systems provide partial hardware and software support for the RS-232 standard. A special adapter cable is required to match the non-standard connector and voltage of the computer's user port to the official RS-232 devices. The Centronics connection is not supported by the Commodore computers, although it is possible via software and a suitable cable to configure the user port to behave just like a Centronics port. The driving software for the Centronics port must be loaded separately, as the computer's operating system does not support it directly. Many commercial software packages, most notably word processors, provide for support of an RS-232 or a Centronics device on the user port in addition to the approved Commodore standard.

The Commodore operating system directly supports printer output to the proprietary serial port. All Commodore printers and disk drives are designed to daisy chain from the serial port. Thus for maximum compatibility with the Commodore operating system, the best way to connect a printer is via the serial port. This has the added advantage of making it very easy to LIST a BASIC program.

The Fundamental Task

The printer interface connected to the serial port must perform two tasks. First and foremost, it must provide the hardware translation between the serial port and either a Centronics or an RS-232 connection. The majority of printer interfaces are designed for use with the Centronics standard. Second, the interface should also provide for the translation of the non-standard Commodore character set to the standard ASCII which is understood by the printer. Most serial port interfaces will also perform some form of translation of the Commodore graphics symbols in a program listing to a more readable form.

The Commodore computers actually support two character sets. The default set contains the upper case alphabet and a diverse collection of graphic symbols. The alternate character set consists of the upper and lower case text characters and a part of the graphics characters. All of the characters may also be displayed in reverse mode as light text on a dark background. Under certain conditions the reverse characters are used as screen and printer control codes. The code for the Commodore character sets is often referred to as PETSCII in deference to the original PET computers which introduced the system. For most everybody else, the text code is known as ASCII for American Standard Code for Information Interchange.

Of course Commodore printers are completely conversant in the Commodore character sets. On the other hand, non-Commodore printers tend to get flustered when spoken to in PETSCII. The first Commodore printer intended for "home" use was the VIC-1515, which afflicted the user with a substandard sized paper among other things. The VIC-1515 was superseded by the VIC-1525 which used standard paper but was still somewhat lacking in terms of print speed and print quality. Commodore users of four years ago tolerated these printers in spite of their shortcomings, as at a $300 selling price they were considerably less expensive than anything else on the market.

In spite of their shortcomings, the VIC-1515 and 1525 set the emulation standard which all Commodore printer interfaces adhere to. The reason is simply that every piece of commercial software we have seen which requires the use of a printer will directly support the VIC-1515 and 1525 as a bare minimum. For some software the VIC-1515 is the only directly supported printer.

The Hot Shot Plus

The Hot Shot Plus is the most recent entry in the Commodore printer interface competition. Not unexpectedly it provides several unique features above and beyond the basic tasks of printer interfacing and 1525 emultion. Some of these unique features include built-in software, special graphics modes, and the direct support of a very large RAM buffer.

Hardware and Buffer

As with many other interfaces we have seen, the Hot Shot Plus is packaged in a VIC 20 cartridge case. Inside the Hot Shot Plus we found the mandatory microprocessor, 32 kilobytes of ROM, 8 kilobytes of RAM, no less than 16 miniature DIP switches, a reset pushbutton, and a collection of TTL "glue" chips. This works out to nearly 3300 bytes of memory per square inch of interface, somewhat more than what we have previously come across. This memory density may be boosted by the user to nearly 7900 bytes per square inch. The Hot Shot Plus will support up to 64 kilobytes of onboard static RAM. Simply replace the supplied 8 kilobyte RAM chip with a 32 kilobyte chip and install a second 32 kilobyte chip in the remaining empty socket. The onboard jumpers let the Hot Shot Plus recognize 16 kilobyte and 40 kilobyte RAM configurations as well.

The primary advantage of a large print buffer is that it will accept text at a faster rate than the printer can put

READER SERVICE INDEX

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it on paper. This should free up the computer somewhat faster than if it had to wait for the printer to finish its job. For this application, even the Commodore slow serial bus is still several times faster than the typical printer.

The buffer in the Hot Shot Plus did offer some improvement over a direct connection to the printer. However, the buffer was not as fast as it could have been. We have seen other buffered serial port devices, with an 8K buffer, accept a short document in one third the time it took the Hot Shot Plus. The most notable shortcoming of the buffer's operation was its refusal to accept more than a minimum of text if the printer was not online. We had developed the habit of sending entire documents to our interface's buffer before even starting the printer. This was just not possible with the Hot Shot Plus.

The Hot Shot Plus draws its power from the 5 volt supply at the computer's cassette port. We measured its current drain at a healthy 250 milliamperes. This is not a significant amount for the C-128. However, the C-64's power supply has been noted for its intolerance of additional loads. Users of the Hot Shot Plus with the C-64 should consider a supplemental 5 volt power supply for it, as described in the December 1986 issue.

Fonts Galore

The Hot Shot Plus's buffer does have a number of other uses, particularly if it is expanded to the full 64 kilobytes. The Hot Shot Plus comes with six near letter quality fonts in its 32 kilobyte ROM. These fonts are printed at the maximum available resolution of your printer. For example, on an Epson-type printer the maximum available resolution is 240 dots per inch. Compare this to the 60 dots per inch of the draft quality text on the same printer.

Using the built-in fonts does extract a speed penalty. For many printers, graphics are printed unidirectionally while text can be printed bidirectionally. In addition, the quad-density graphics on Epson-type printers requires two passes of the printhead to access every dot. Thus near letter quality text will be printed at less than one fourth the speed of draft quality text. We emphasize that this is a limitation of the printer, not the Hot Shot Plus interface. Printers with a built-in near letter quality mode will operate with the same speed restrictions.

The Hot Shot Plus's set of six built-in fonts actually consists of a Correspondence font and a Helvetica font in regular, italic, and bold formats. Three of the DIP switches are devoted to font selection. This allows for the hardware selection of up to two additional fonts from RAM. The default eight kilobyte buffer can accept two regular fonts or one high resolution font. Regular fonts are designed on a 9 by 16 dot grid. High resolution fonts are designed on an 18 by 16 dot grid.

If the built-in buffer is expanded to its maximum of 64 kilobytes, then up to 36 additional regular fonts can be uploaded to the interface. As before, only the first eight fonts can be accessed via the DIP switches; however, all of the fonts may be accessed under software control.

Interface Control

The Hot Shot Plus may be controlled by the user in several ways. The hardware approach involves indirect tactile manipulation of the 16 DIP switches. A small pointed object is best for this, as the switches are much too small for the typical ham-handed hacker or even the most dainty of programmers. As we mentioned above, three of these switches are devoted to font selection. Four more are accounted for by printer selection, although only eight distinct printer types are implemented.

Two switches are occupied with the mundane tasks of device number (4 or 5) and linefeed control (to linefeed or not to linefeed upon a carriage return). The interface has four distinct operating modes which fully occupy two more DIP switches. The first operating mode results in total emulation of the 1525 printer. We must note that the first two operating system ROM revisions we received did have some emulation bugs. Hopefully these will all be swatted by the time this review sees print. The Enhanced Features Mode is an enhanced emulation mode which includes easy to read program listings. The ASCII Translation Mode converts all text characters from PETSCII to ASCII while passing all control codes to the printer without any modification. The Transparent Mode turns off all code translation, allowing the computer to communicate directly with the printer.

A single switch is devoted to a so-called CP/M mode. This is intended to correct the missing carriage returns, associated with linefeeds, which afflicted the early release of the C-128 CP/M. Hopefully, active CP/M users have upgraded their CP/M disks by now.

Last, but far from least, we acknowledge the font selection switch and the Graphics Enhancement Mode switch. The former enables the built-in fonts. The latter causes your printer to switch to double density mode. We cannot understate the significance of double density mode. It causes 1525 graphics emulation to be printed at 120 dots per inch on printers which can handle it. This does not add any additional detail to the 1525 mode graphics dumps. By doubling and overlapping the printed dots, double density does result in a denser printed image with noticeably higher contrast. This switch will also

implement double density when doing a single density dump directly to the printer.

Perhaps the greatest beneficiaries of the double density feature will be GEOS users. We noticed a marked improvement in GEOS output, in both 1525 mode and direct to printer mode, with the double density feature. The font selection switch has an additional effect when used in conjunction with the Graphics Enhancement Mode switch. When both switches are on, a 1525 type graphics dump will be printed, using the quad-density mode on those printers which can handle it. This effectively raises the dot density to 240 dots per inch while resolution remains at 60 dots per inch. Once again, enhanced contrast and print uniformity are the prime benefits. We feel that the Hot Shot Plug's Enhanced Graphics Mode may be this interface's most useful feature.

We have wandered somewhat from the topic of interface control. The Hot Shot Plus is controlled by the traditional Commodore technique of changing secondary addresses. It also recognizes an extensive set of direct Escape code control sequences. Last but not least, the Hot Shot Plus supports a command channel as secondary address 15, just like the disk drive. As a result, many of the Hot Shot Plus's features may be accessed in four ways: hardware switches, secondary addresses, direct Escape codes, and command channel.

ROMware and Diskware

The Hot Shot Plus is accompanied by several utility programs and a floppy disk. Interestingly enough, the utility programs are not found on the floppy disk. They are stored in the interface ROM which is treated as a ROM disk with device number 4. You cannot SAVE to this ROMdisk, but you can LOAD the utility programs from it. The simplest program is a status report from the interface which is LISTed to the screen. The ROMdisk also contains a full-featured font editor for creating or modifying interface fonts. New fonts may be stored on disk for subsequent uploading. Uploading may be done via the font editor or via the Autoup utility. This ROMdisk program reads a textfile on the disk which tells it which fonts to upload to the interface. The program which creates the Autoup text file is found on the floppy disk.

The floppy disk also contains a copy of the built-in fonts as well as nine additional fonts. This is obviously a long way from the 42 fonts which may be needed to fill the interface's 64 kilobyte buffer. Since font designing is a time-consuming process, a possible alternate source was provided for. The floppy disk contains an X-O converter program. X-O is short of Xetec to Omnitronix. In this case Xetec refers to the Xetec Super Graphix printer interface.

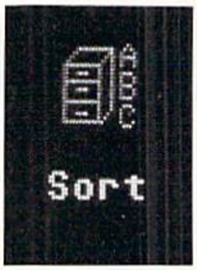
The Super Graphix was the first printer interface to make extensive use of fonts. It has a built-in near letter quality font and an eight kilobyte buffer, and is accompanied by a floppy disk which contains dozens of fonts. The X-O converter program converts the Xetec fonts to a form compatible with the Omnitronix interface. Since the Xetec font disk is not readily available without the Super Graphix interface, it is not clear to us how one would apply the X-O converter utility to it. Since the Super Graphix is a very competent interface in its own right, we cannot see a strong incentive to give it up just to get access to its font disk.

While we are on the topic of Xetec we should mention that we are eagerly awaiting the appearance of the Super Graphix Gold printer interface. We understand it has already passed FCC approval and we should have a sample Real Soon Now. The Super Graphix Gold is expected to have a 32 kilobyte buffer, eight operating modes, fast serial I/O with the C-128, and numerous other features. In some ways it is reminiscent of the Device One printer interface we looked at in the December 1986 issue. Obviously the interface competition is not yet over.

Conclusion

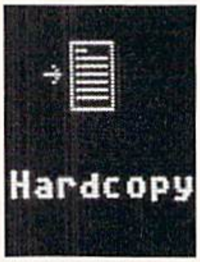
That about wraps it up for this installment on printer interfacing. The Hot Shot Plus is definitely shaping up as a strong contender in the Printer Interface finals. Its font handling and high density graphics make it well worth considering.

Omnitronix, Inc., 760 Harrison St., Seattle, WA 98109 (phone: 206-624-4985). *—Morton Kevelson*



INFOFLOW 64

Icon Database for the C-64



By Cleveland M. Blakemore







If you're familiar with *Infoflow 128*, you'll find this version for the 64 nearly identical to that program, published in the April 1987 *Ahoy!* The *Infoflow* database uses icons (pictures) instead of a menu for selection of different functions. Rather than type in a numeric choice, you use an arrow or pointer to select different pictures, at which time program flow is directed to the appropriate subroutine.

Although the following program is designed to work with Commodore's mouse, the 1350, it will also work with any high-quality joystick plugged into Port 2.

The program takes a few seconds to boot up, as it has to POKE some data into memory. When the screen reappears, you will be looking at the screen of *Infoflow 64*, an icon-operated database.

A database is a software environment that is used to keep track of information, and to organize and store it in such a way as to make the information useful to human beings.

All databases have several things in common. They have the capability to add information, modify existing information, delete information, sort information, list information, search through information, and print out information.

Infoflow is intended to simulate a physical filing system, with file cabinets, file drawers, trash cans, and folders. This type of layout makes it easier for the human mind to visualize exactly what's going on at the storage level. You can think of each different file, with categories like Stamps, Tapes, or Personal Information, as being a drawer in a file cabinet. Each folder in this file cabinet would be a RECORD, and each record would have several FIELDS, or categories of information.

For instance, in a drawer called PERSONAL DATA, we might have 50 records. Each record might have three fields, such as Name, Address, Phone Number. Each field should have an entry, so that any time we want, we can find information for that record, like the phone number of one of our friends, in the record with his name.

Infoflow 64 accesses this information through icons, each icon representing a different operation to be performed on the data. There are eight icons to choose from on the screen. Touch an icon and push the fire button to access it.

The upper four icons are labeled SAVE/LOAD (disk drive with disk above it), NEW FILE (filing cabinet), DELETE (trash can), and VIEW/ADD (eyeball).

The lower four are labeled SORT (file cabinet with letters "ABC" beside it), SEARCH (picture of several folders with arrow running alongside them), HARDCOPY (arrow pointing to manuscript), CURRENT RECORD (file cabinet with drawer open and folder to left side).

Our filing cabinet is empty when the program first starts, so we'll either have to load in an old file previously created or initialize a new file. To create a new file, select the icon NEW FILE. There is a beep, and we see the prompt "Filename", indicating *Infoflow* needs to know what we are going to call the new file we are creating. We'll type in "Personal" and hit RETURN.

Infoflow has a special input routine that accepts commas, colons, and even quotation marks. Using commas in addresses and lists is often very important, but BASIC 2.0 issues an EXTRA IGNORED error when it finds a comma in the input buffer. *Infoflow's* input routine also ignores all cursor movements and control characters, accepting only alphanumeric input. The only control keys functioning are the DELETE key to back up over mistakes, and the RETURN key. This input routine saves a lot of hassle and trouble normally associated with BASIC's input command. *Infoflow* also uses GET# to retrieve and save information to disk, because INPUT# does not properly receive strings with embedded commas.

Since *Infoflow* prefixes files on the disk with an "IF[" to identify only those files pertinent to it, filenames are limited to 10 characters or less. This should not prove to be a problem, unless you have similar files you want to save, and 10 characters is not enough to give them distinctive names. You could label one file in uppercase, and the other in lowercase, if you have such a problem.

After typing in the file name, you will be asked for the number of fields. Type in "3" (Name, Address, Phone) and hit RETURN. The maximum number of fields permitted is 22. Now the program prompts you for the Name and Length of each field. Type in the name of each field and the maximum length, in characters, you will want each field to be limited to. If you are not sure, the default is 160. Hit the space bar and RETURN at the length prompt if you want the field to default to 160 characters. The max length for any field is 254 characters, which is pretty darned big,

PHOTOS: MICHAEL R. DAVILA

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Now the computer will approximate how many records can be held in memory simultaneously and ask you if you want to proceed. If you like the file you have designed, hit A for accept. If you hit R the program will return to the main menu without creating the file. It will take a moment for the program to erase the file and return to the command screen.

When you return to the command screen, you will notice that CURRENT RECORD has been set to 1 and that the available record space left in memory is displayed at lower right, to keep you informed of how many more records you can fit into this file.

Now that we have a file created, let's go to VIEW/ADD and start putting something into it. Once you enter VIEW/ADD you will find yourself looking at the record number set in CURRENT RECORD. You can flip forward through the records by moving the mouse or joystick right, and you can go back by moving it left. If you push your controller up, you will be in Insert/Modify mode, at which time you can make new entries in each field, or hit RETURN to leave the previous entry for that field unchanged. You will be limited to the maximum number of characters for that field that you set when you created the file. If you go over the 40 column line length, the screen will be scrolled down to make room for your input. If you input more than 80 characters, it may mess up some of the screen formatting, but when you are finished, the record will be printed over again correctly formatted.

If you enter a new record at the end of the file, the end-of-files pointer will be bumped up by one. Each time you enter a new record at the end of the file, the pointer will be bumped up by one to make room for another entry. The first field of each record is considered the "header"–if this header is blank, the record is considered blank. To make a new entry, you must put something in the header.

To exit from Insert/Modify, hit the button on your controller to return to the icon screen. You will notice that the last record you accessed will be set beneath the CURRENT RECORD icon.

It may seem too slow to move to the record you want in Insert/Modify. You might want to jump around very quickly in a large file, from record to record. This is the purpose of the CURRENT RECORD icon. Move your arrow to it and push the button. Now you can move rapidly forwards or backwards with your controller through the record numbers. For a fast change, move it left or right. For a really fast change, move up to count by tens through the records forward, or down to count backwards by tens. Once you have the record you want set beneath the icon, hit the button to exit. Now this is the first record you will examine if you enter VIEW/ADD again.

If you want to get rid of some old records in a hurry, select DELETE, the trash can. You will be prompted to delete the (C)urrent record, (S)can, delete (A)ll Records, or (E)xit (in case you decide you were a bit hasty). Hit C and the current record number will be erased. If you hit S, you will be able to flip through the records as in VIEW/ADD, and select records to be deleted by pushing SHIFT-D. Hit SHIFT-E to exit Scan. You will notice that whenever a record is deleted, all the records above it are moved down to fill in the blank, and the end-of-file pointer is decremented by one.

If you select A for All records, the program will verify with a Yes-No prompt in case you have second thoughts. Otherwise the whole file will be erased irretrievably from memory, and you will be returned to the icon screen.

You will probably want to SORT your records alphabetically sooner or later, and there is a very fast Shell-Metzner sorting routine in the program for just this purpose. Select the field you want the sorting routine to use for comparisons (usually 1 for the header) and there will be a delay as the sort routine works, depending on the size of the file. The program returns with SORT COMPLETE before you are returned to the icon screen.

If you are looking for a certain entry, group of letters, or subject in your database file, you will want to use the SEARCH icon. The maximum length of the string to search for is 24 characters. After you hit RETURN, the program will display every occurrence of that string in your file, at which time you can either modify or insert information for that entry, just like in VIEW/ADD. Each time you hit the button, the computer will begin the search again, displaying each occurrence of that string, until it reaches the end-of-file marker. The search command does not find imbedded strings; it only locates strings that are the first occurrence in that field. For example, if you type in "Letter" for your search string, *Infoflow* will find "Letterman,Dave" but would miss "Dave Letterman."

If you are going grocery shopping, or you want to call each customer you have in your database, you will need a HARDCOPY. The program prompts you for the range of records you want printed. The defaults are the beginning and ending markers for the file. The hardcopy will be aborted if the printer is not turned on.

After all this arrow moving and clicking, you may want to wrap things up and call it a day, so go to SAVE/LOAD and save your file to disk. Any existing file with the same name will be scratched and replaced with the new one.

Now that your data is safe on the disk, move your arrow to the lowest line on the screen and hit the button. The QUIT? bar lights up. Moving your arrow in any other direction will take you back to the screen, but clicking the button twice exits *Infoflow*.

The SAVE/LOAD routines and all program I/O are monitored for errors to prevent system crashes if the printer is off line, if the drive device number is wrong, etc.

You'll find that *Infoflow* is one of the simplest, fastest databases you'll ever use. C-64 owners need no longer envy the 128 version, since this adaptation is almost identical to that program, with the exception of memory. *Infoflow 64* has less than 30% of the memory available to the 128 mode program, but it should come in handy for any small filing application. A moderate sized Address file can hold about 200 records–more than enough for ordinary use.

If you should accidentally hit RUN STOP/RESTORE, you'll have to type POKE648,4 blindly to get the cursor back, since *Infoflow 64* operates up in the third bank of the VIC chip. The best way to exit is through the QUIT icon. ☐

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COMMODARES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #49-1: ROME REVISITED

This problem was submitted by Richard van Frank (Montclair, NJ). Very simply, the user enters an integer from 1 to 3999. The computer displays the Roman numeral for that integer. Some of you may recall this problem from the October 1984 *Commodares*. I don't generally accept duplications, since I know some of you have been solving these problems since the first issue of *Ahoy!* in January 1984. On the other hand, those of you who solved this problem before are probably much better programmers than you were then, so give it another try. (It might be interesting to compare your present solution with your previous one.)

PROBLEM #49-2: SCORE KEEPER

Try this one from Joseph Sweely (Pennsauken, NJ). Write a routine which allows the user to enter a score and his initials. The routine saves and displays the top five scores in order (along with the initials) that have been entered since the program was started. This routine would typically be used as part of a game program.

PROBLEM #49-3: SPRITE FLIPPER

Here is another one from Joseph Sweely. Write a program that flips (reverses) a sprite from left to right. Define a sprite with DATA statements and display it. Then call the Sprite Flipper routine which flips the sprite and displays it facing the opposite direction.

PROBLEM #49-4: EASY AS...

Using only +,−,/,*, and exponentiation operations (no trigonometric or transcendental functions), calculate pi as accurately as you can. PRINT 22/7 is a start, but surely you can do better than that.

This month we will discuss the best solutions to *Commodares* from the September issue of *Ahoy!* Before we begin, let me mention a letter from Charles Kluepfel (Bloomfield, NJ) concerning the probability calculation for *Problem #42-2: Cliff Hanger.* Charles sent an analysis of the problem which is more complicated than the analysis originally presented. The following program calculates the probability of successfully reaching one end of the log or the other to be 0.087, or roughly once out of every 12 tries. This agrees with the trial runs I made with this problem. Send a self-addressed, stamped envelope to me if you would like to see Charles' analysis of this problem.

```
•1 REM ====================================
•2 REM    PROBABILITY CALCULATION FOR
•3 REM    PROBLEM #42-2:CLIFF HANGER
•4 REM    BY
•5 REM      CHARLES KLUEPFEL
•6 REM ====================================
•10 N=10:Y=10:F=2[UPARROW](-10):T=F
•20 FOR N=11 TO 17
•30 F=F*(2*N-Y-2)*(2*N-Y-1)/(N*(N-Y))/4 :
 T=T+F
•40 NEXT
•50 PRINT USING "#.[6"#"]";2*T
```

Now for this month's solutions. The first was *Problem #45-1: Ideal Input* suggested by Bret Ekstrand (Signal Hill, CA). The challenge was to write a routine which allows the user to input commas, quotation marks, and colons as well as text without the "Extra Ignored" error or other problems associated with the INPUT command. The subroutine should take exactly whatever the user types and store it in U$. Also the INST/DEL key should work properly.

There were many solutions to this one. The most obvious answer is to use the GET statement (Commodore 64) or the GETKEY statement (Commodore 128). These statements read a character at a time and are not affected by commas or other troublesome keystrokes. The two problems with using the GET or GETKEY statements are 1) they don't display the input characters on the screen, and 2) they don't provide a cursor.

The following program from Jim Speers (Niles, MI) solves the cursor problem with the POKE statements in lines 110 and 150.

```
•1 REM =================================
•2 REM    COMMODARES PROBLEM #45-1 :
•3 REM      IDEAL INPUT
•4 REM    SOLUTION BY
•5 REM      JIM SPEERS
•6 REM =================================
•100 TY=204:IF FRE(0)<>FRE(1) THEN TY=259
 9
•110 U$="":POKE TY,0
•120 GET Z$:IF Z$="" THEN 120
•130 IF Z$=CHR$(13) THEN 150
•140 U$=U$+Z$:PRINT Z$;:GOTO 120
•150 POKE TY,1:PRINT" ":PRINT:PRINT"[DOWN
 ][DOWN]"U$
```

Line 100 determines the proper POKE location for the C-64 or the C-128. FRE(0) and FRE(1) have the same value on the C-64, hence TY is given the value 204. On the C-128, FRE(0) returns the amount of free program memory, and FRE(1) gives the amount of free variable storage. These two numbers will generally be different, and TY will have the value 2599.

POKE TY,0 turns the cursor on, and POKE TY,1 turns it back off, but only for the 40-column screen. If you use the 80-column screen on the C-128, Brendon Bourdo (Grand Haven, MI) suggested using this Escape-U command to enable the cursor:

```
115 PRINT CHR$(27)"U" : REM ENABLE 80-CO
LUMN CURSOR
```

Another alternative is to use Escape-S (PRINT CHR$(27) "S"). Escape-S turns on a block cursor, and Escape-U turns on an underline cursor. Take your pick.

With this program, you may enter any keystrokes. If you press the quotation mark, it is displayed and the computer enters "quote mode." Now the cursor movements and color codes are displayed as ASCII characters. A second quotation mark exits from quote mode. Now cursor movements and color commands are implemented immediately. In either case, all keystrokes are saved in U$.

Pressing DEL deletes the previous character as it normally does, but the DEL keystroke is also saved in U$. As a result, when you press Enter to terminate your input, you may momentarily see the deleted character displayed on the screen before it is erased. Some readers used statements such as these to treat the DEL key separately so that it did not become part of U$:

```
IF K$=CHR$(20) THEN U$=LEFT$(U$,LEN(U$)-
1) : PRINT K$
```

CHR$(20) is the ASCII code for the DEL key. The LEFT$ statement drops the previously typed character from the end of U$. The PRINT statement causes the last character to be erased from the screen.

Bill Stech (Coshocton, OH) said if you don't like the way the BASIC INPUT statement works, the simple solution is to rewrite BASIC. And here's how he did it on the C-64.

```
•1 REM =================================
•2 REM    COMMODARES PROBLEM #45-1 :
•3 REM      IDEAL INPUT
•4 REM    SOLUTION BY
•5 REM      BILL STECH
•6 REM ======  C-64 ONLY  ==============
•100 POKE 1,55   :REM SELECT ROM BASIC
•105 PRINT"THIS TAKES OVER 40 SECONDS[3".
 "]"
•110 FOR T=40960 TO 49151:POKE T,PEEK(T):
 NEXT
•120 POKE 44136,0:POKE 44183,0:POKE 43968
 ,255:POKE 44140,0:POKE 44144,0
•130 POKE 1,54 :REM SELECT RAM BASIC
•140 INPUT U$ :REM CAN USE COMMAS NOW
•150 PRINT U$
```

Line 110 transfers BASIC from ROM to RAM so that it can be changed. Line 120 makes the changes. Line 130 selects the RAM version of BASIC which now allows commas (and everything else) to be entered with the INPUT statement. Bill said the only side effect is that multiple items cannot be contained in DATA statements since commas are not allowed there either. The solution is to select ROM BASIC first with POKE 1,55, then READ the data, and finally switch back to RAM BASIC with POKE 1,54. If a reset occurs, just POKE 1,54 to reactivate RAM BASIC. That's the easy way to fix the parts of BASIC you don't like.

Problem #45-2: Fade Away was an interesting challenge from John Yergaw (London, ONT). The only requirement was to make a word on the screen fade away. Clever *Commodare* readers were able to find no fewer than six dis-

tinctively different ways of doing that.

The most common approach is exemplified by this program from David Alan Wright (New Britain, CT).

```
•1 REM ====================================
•2 REM    COMMODARES PROBLEM #45-2 :
•3 REM       FADE AWAY
•4 REM    SOLUTION BY
•5 REM       DAVID ALAN WRIGHT
•6 REM ====================================
•10 POKE53281,0:POKE53280,0:C$(1)="[WHITE
 ][c 8][c 5][c 4][BLACK]":C$(2)="[WHITE][
 YELLOW][c 3][c 1][RED][c 2][BLACK]":C$(3
 )="[WHITE][c 7][BLUE][BLACK]"
•20 C$(4)="[WHITE][c 6][CYAN][GREEN][BLAC
 K]":FORI=1TO4:FORJ=1TOLEN(C$(I)):PRINTMI
 D$(C$(I),J,1)"[UP]FADE"
•30 FOR K=1TO500 : NEXTK,J,I
•40 PRINT"[WHITE]"
```

This program fades a word from white to black four times, each time in a different color band. The MID$ statement in line 20 takes one color code at a time from the C$( ) arrays. After the color code is printed, the word "FADE" is shown in the chosen color.

Paul Schmidt (San Diego, CA) took a similar approach, but he arranged all the colors in one string for use on a monochrome monitor only in 40-column mode. Change C$(1) in the program above to

```
C$(1)="[WHITE][c 6][YELLOW][c 8][CYAN][G
REEN][c 3][c 5][c 7][PURPLE][c 1][RED][c
 4][c 2][BLUE][BLACK]
```

You may remove the I FOR/NEXT loop in line 20 to see just Paul's solution. Remove the cursor-up code from the "FADE" string in line 20 to see all the shades displayed on the screen.

Clayton Whisman (Winchester, KY) sent the following solution for the C-64.

```
•1 REM ====================================
•2 REM    COMMODARES PROBLEM #45-2 :
•3 REM       FADE AWAY
•4 REM    SOLUTION BY
•5 REM       CLAYTON WHISMAN
•6 REM ====== C-64 ONLY ================
•10 PRINT"[CLEAR]":PRINTTAB(1)"[10"[DOWN]
 "]FADE":PRINTCHR$(142):CLR
•20 POKE56334,PEEK(56334)AND254:POKE1,PEE
 K(1)AND251
•30 FORI=1TO511:POKEI+12288,PEEK(I+53248)
 :NEXTI
•40 POKE1,PEEK(1)OR4:POKE56334,PEEK(56334
 )OR1:POKE53272,(PEEK(53272)AND240)+12
•50 FORX=0TO7:FORN=1TO4:READA:POKEA,0:FOR
 T=1TO30:NEXTT:NEXTN:NEXTX:END
•70 DATA 12339,12297,12327,12335,12337,12
 303,12321,12329
•80 DATA 12340,12296,12324,12328,12343,12
 301,12323,12334
•90 DATA 12336,12298,12322,12332,12341,12
 299,12325,12330
•100 DATA 12338,12302,12320,12333,12342,1
 2300,12326,12331
```

This program randomly turns off bits in the characters F,A, D, and E. The program works so well in fact that the READY prompt when the program is done looks like this: "R Y." Press RUN STOP/RESTORE to return the characters to normal.

Norman Richards (Angleton, TX) sent two unique solutions to this problem. They are combined into the following program.

```
•1 REM ====================================
•2 REM    COMMODARES PROBLEM #45-2 :
•3 REM       FADE AWAY
•4 REM    SOLUTION BY
•5 REM       NORMAN RICHARDS
•6 REM ====================================
•10 REM ---- FIRST PROGRAM -------------
•20 FORA=100TO1STEP-1:PRINT"[CLEAR][5"[DO
 WN]"][4"[RIGHT]"]FIRST":FORB=1TOA:NEXT:P
 RINT"[CLEAR]":NEXTA
•100 REM ---- SECOND PROGRAM -----------
•110 W$="SECOND"
•120 L=LEN(W$):C$="[HOME][5"[DOWN]"][5"[R
 IGHT]"]":D$="[HOME][5"[DOWN]"][4"[RIGHT]
 "]"
•130 FOR I=1 TO L:FOR B=1 TO 5
•140 PRINT C$" "W$" "
•150 FOR A=1 TO 50 : NEXT
•160 PRINT D$" "W$" "
•170 FOR A=1 TO 50 : NEXT
•180 NEXT B
•190 D=D+1:IF D=2 THEN D=0:W$=RIGHT$(W$,L
 EN(W$)-1):GOTO 210
•200 W$=LEFT$(W$,LEN(W$)-1)
•210 NEXT I
•220 PRINT"[CLEAR]"
```

The first one-liner fades the word by blinking it away. The second program rattles the word from side to side until it has vanished.

The next solution is from Robert Marcus (Agincourt, ONT). This is similar to Clayton's program in that it turns off bits within character memory.

```
•1 REM ====================================
•2 REM    COMMODARES PROBLEM #45-2 :
•3 REM       FADE AWAY
•4 REM    SOLUTION BY
•5 REM       ROBERT MARCUS
•6 REM ====== C-64 ONLY ================
•50 PRINTCHR$(142)CHR$(147)
•60 PRINTTAB(82)"THERE WILL BE A SLIGHT D
 ELAY BEFORE"
```

```
•65 PRINTTAB(82)"THE CHARACTERS BEGIN TO FADE BEFORE"
•70 PRINTTAB(82)"YOUR EYES"
•100 POKE254,PEEK(56):POKE56,56:CLR:REM PROTECT CHAR. MEM. FROM BASIC
•105 DIMN(7):N(0)=3:N(1)=1:N(2)=6:N(3)=0:N(4)=5:N(5)=7:N(6)=4:N(7)=2
•110 POKE 56334,PEEK(56334)AND254
•120 POKE 1,PEEK(1)AND251
•130 FORI=0TO272:POKEI+14336,PEEK(I+53248):NEXT:REM MOVE FIRST 34 CHARACTERS
•140 POKE1,PEEK(1)OR4
•150 POKE56334,PEEK(56334)OR1
•160 POKE53272,(PEEK(53272)AND240)OR14:REM NEW CHAR. MEM. LOCATION
•170 PRINTTAB(85)"NOW WE SHALL BEGIN FADING OUT"
•180 FORI=0TO7:BI(I)=2[UPARROW]I:NEXT:REM SET BIT
•190 FORJ=0TO7:FORI=14344TO14608
•200 POKEI,PEEK(I)ANDNOT(BI(N(J))):NEXT:NEXT:REM WIPE OUT CHAR'S BIT BY BIT
•220 PRINT"[CLEAR]":POKE53272,(PEEK(53272)AND240)OR4:REM RETURN TO ROM CHAR MEM.
•230 POKE56,PEEK(254):CLR:REM PUT TOP OF MEM BACK
```

This program works only on the C-64. The full screen of text will vanish before your very eyes.

The final solution to this problem is the short program written by Tom Griffin (Owatonna, MN). This is a very clever application of the fading letters concept.

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #45-2 :
•3 REM       FADE AWAY
•4 REM    SOLUTION BY
•5 REM       TOM GRIFFIN
•6 REM ===================================
•10 PRINTCHR$(147):POKE646,0:POKE53281,0:POKE53280,0:DIMC(12):M=55445
•15 A$="  COMMODARES  ":PRINT:PRINT:PRINT:PRINTA$A$A$:FORL=0TO12:READC(L):NEXT
•20 FORP=1TO50:FORL=0TO12:POKEM+P+L,C(L):NEXT:NEXT:GOTO20
•25 DATA 0,11,12,15,1,1,1,1,1,15,12,11,0
```

Tom's solution causes the words to fade in and out as if a spotlight were panning them. C-128 users should change the POKE 646,0 in line 10 to POKE 241,0. This program must be run in 40-column moide on the C-128. Very impressive indeed, Tom!

Problem #45:3 Super Bowl was suggested by Oren Dalton (El Paso, TX). It was a rather tough problem. Jim Speers (Niles, MI) sent the easiest solution to understand.

```
•1 REM ===================================
•2 REM    COMMODARES PROBLEM #45-3 :
•3 REM       SUPER BOWL
•4 REM    SOLUTION BY
•5 REM       JIM SPEERS
•6 REM ===================================
•100 DIMMX$(20),MN$(20),MX(20),MN(20)
•110 B$="[10"/"]":FORI=1TO8:READX$(I),X(I),Y(I):NEXTI:A$="X"
•120 FORI=1TO4:READX1$(I),X1(I),Y1(I):NEXTI:FORI=1TO10:MN(I)=300:NEXTI:NX=1:NN=1
•130 DATAXXX,30,30,XX/,29,20,X/X,20,20,X//,20,20,/XX,20,20,/X/,20,20,//X,19,10
•140 DATA///,19,10,XX,25,20,X/,20,20,/X,20,20,//,19,10
•150 FORA=1TO6:FORB=A+1TO7:FORC=B+1TO8:FORD=C+1TO9:FORE=D+1TO10
•160 S$=B$:MID$(S$,A)=A$:MID$(S$,B)=A$:MID$(S$,C)=A$:MID$(S$,D)=A$:MID$(S$,E)=A$
•170 GOSUB200:NEXTE,D,C,B,A
•180 PRINT"[CLEAR][DOWN][RVSON] MAXIMUM [RVSOFF]":FORI=1TONX:PRINTMX$(I);MX(I):NEXTI
•190 PRINT"[DOWN][RVSON] MINIMUM [RVSOFF]":FORI=1TONN:PRINTMN$(I);MN(I):NEXTI:END
•200 SX=15:SN=15:FORI=1TO8:T$=MID$(S$,I,3)
•210 FORJ=1TO8:IFT$<>X$(J)THEN230
•220 SX=SX+X(J):SN=SN+Y(J):J=8
•230 NEXTJ,I:T$=MID$(S$,9,2):FORJ=1TO4:IFT$<>X1$(J)THEN250
•240 SX=SX+X1(J):SN=SN+Y1(J)
•250 NEXTJ:IFSX>MX(NX)THENNX=1:MX(NX)=SX:MX$(NX)=S$:GOTO270
•260 IFSX=MX(NX)THENNX=NX+1:MX(NX)=SX:MX$(NX)=S$
•270 IFSN<MN(NN)THENNN=1:MN(NN)=SN:MN$(NN)=S$:RETURN
•280 IFSN=MN(NN)THENNN=NN+1:MN(NN)=SN:MN$(NN)=S$
•290 RETURN
```

The problem was to find the minimum and maximum bowling scores possible for a game with five spares and five strikes. We assumed (for simplicity) that only five pins were dropped after the tenth frame. Jim assumed that for the maximum score, the first ball of a spare following a strike was a 9. For the minimum the first ball of the spare was a gutter ball (0).

With strikes in both the 9th and 10th frames, Jim assumed that all five pins made after the 10th frame were on the first extra ball for the maximum. For the minimum he assumed the first extra ball scored no pins. Recall that the score for a strike is 10 points plus the scores on the next two balls. The score for a spare is 10 points plus the score on the next ball. Strikes are shown as X's and spares are shown as /'s.

In Jim's program for the C-128, lines 100-140 create the necessary variables. Notice how the scores are stored in the DATA statements. Lines 150-170 create all possible strings containing five strikes and five spares. Line 160 must be changed for the C-64 which does not allow MID$ on

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- I Got Biorhythm (5/84)
- Lawn Job (10/84)
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- Math Master (5/84)
- Micro Minder (8/84)
- Multi Draw 64 (1/84)
- Name That Star (4/84)
- Post Time (6/84)
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the left side of the assignment statement. Each statement of the form MID$(S$,X)=A$ can be replaced by

```
S$=LEFT$(S$,X-1)+A$+MID$(S$,X+1)
```

The subroutine at line 200 calculates each score and compares it with the current minimum and maximum. The minimum and maximum are saved in line 250-280. There are fourteen combinations that give the minimum score of 165, and four combinations that give the maximum score of 231.

Congratulations also to Robert Marcus (Agincourt, ONT) and Gary Bond (Topeka, KS) for good solutions to a tough challenge.

The final problem is *#45:4 Fast Factorial,* suggested by Thomson Fung (San Diego, CA). The problem was to write assembly language code to calculate 5 factorial (5! = 5*4*3 *2*1 = 120), leaving the results in the X register. The shortest solution is this one by Larry Schafer (Westphalia, MI).

```
•1 REM ==================================
•2 REM     COMMODARES PROBLEM #45-4 :
•3 REM        FAST FACTORIAL
•4 REM     SOLUTION BY
•5 REM        LARRY SCHAFER
•6 REM   == MONITOR/ASSEMBLER LISTING ==
•10 :LDA #5       ;START WITH A=5
•11 :ASL          ; A=A*2=5*2
•12 :ASL          : A=5*2*2=5*4
•13 :
•14 :STA $52      ;SAVE 5*4
•15 :ASL          ;A=5*4*2
•16 :ADC $52      ;A=5*4*2+5*4=5*4*3
•17 :
•18 :ASL          ;A=A*2=5*4*3*2
•19 :
•20 :TAX          ;PUT A INTO X
```

To enter this program into the C-128 monitor, type MONITOR from BASIC. Then enter A0C00 LDA #5 to store the program beginning at address $0C00. Press RETURN and continue entering just the instructions (ASL, ASL, STA $52, ASL, ADC $52, ASL, TAX, BRK), pressing RETURN after each one. The BRK provides an end of the program for the monitor.

To see that the program is in memory, enter D0C00. You should see the instructions in addresses 0C00 through 0C0B. Before executing the program, enter R to see the initial value in the X register. Then enter G0C00. The BREAK message will be displayed and the register values are shown. Now the A register and the X register should both have the correct answer (78 hex equals 120 decimal).

The ASL instruction causes the 8-bit value in the A register (accumulator) to be shifted left by one bit. This is equivalent to multiplying by 2. Lines 11 and 12 cause the original 5 in the accumulator to be multiplied by 4. To multiply a number by 3, the easiest way is to double the number and add it to its original value (2*X + X = 3*X). Lines 14-16 multiply the A register by 3. A temporary memory location (address 52 hex) is used to store the original value 5*4. Line 15 doubles this value. Line 16 adds the result to the original value just stored in address 52 hex. Now the A register contains the quantity 5*4*3.

Line 18 doubles the result once more, giving 5*4*3*2 which is the desired answer. Line 20 puts the answer into the X register, as specified.

This problem was a relatively easy assembly language problem since only single-byte mathematics was involved. We didn't even need to worry about the carry bit. It would be harder to make a general factorial calculator. Finding even six factorial would be much more difficult since quantities greater than 256 would be involved, and more than one byte would be needed to store the quantities.

If you want to access this routine from BASIC, you might replace BRK with the following instructions from Thomson's solution:

```
JSR $FFD2
RTS
```

The subroutine at address $FFD2 is the BSOUT kernal routine which displays whatever value is stored in the A register. The RTS instruction causes the program to return to BASIC rather than to the monitor. After entering the program in the monitor, type X to return to BASIC. In BASIC, type SYS 3072. This jumps to the routine at address $0C00. You should see the symbol corresponding to CHR$(120) on the screen. It was put there by the BSOUT routine.

Another way to see the results in the X register from BASIC is with PRINT PEEK(781) on the C-64 or PRINT PEEK(7) on the C-128. A better way to look at the registers on the Commodore 128 after a SYS statement is with the RREG statement:

```
RREG A,X,Y,S : PRINT X
```

The RREG statement stores the A, X, Y, and Status register values in the four variables listed after it. Use the PRINT statement to show the values of any of those variables.

Thanks to all the others with very good (although not quite as short) solutions to this problem. I am looking forward to your solutions and suggestions for next month. Keep them coming. ☐

Congratulations to the following people not already mentioned this month who sent valid solutions to *Commodares:*

Greg Badros (Salisbury, MD)
Claude Bouchard (Laval, QUE)
Rene Boutin (Sherbrooke, PQ)
Hal Cohen (Pepper Pike, OH)
Ernest Croot (Bevinsville, KY)
David Dick (Jarrettsville, MD)
Richard Dowdy (Ft. Hood, TX)
Alberto Gancitano (Brooklyn, NY)
Kris Gilbert (Cadillac, MI)
Jeff Gilbert (Philadelphia, PA)
J. Williams (San Antonio, TX)
Scott Gray (New Bloomfield, MO)
Robert Groysman (Fair Lawn, NJ)
Alan Gutierrez (Forest Hills, NY)
Jason Ivey (Monroe, MI)
Jason Jowers (Jackson, TN)
Jerry Koyne, Jr. (Winchester, IL)
M. Levinton (New Rochelle, NY)
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Jimmy Sethman
David Shobe (Lawrence, KS)
Myong Sik Paek (Portland, OR)
Paul Sobolik (Pittsburgh, PA)
Dave Bazquez (New Orleans, LA)
Jeff Veasey (Lovington, NM)
M. Watson (Denham Springs, LA)
Mike Weno (Cedar Rapids, IA)

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!'s* program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

Call *Ahoy!* at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT CLR/HOME	
[HOME]	Home	CLR/HOME	
[UP]	Cursor Up	SHIFT ↑ CRSR ↓	
[DOWN]	Cursor Down	↑ CRSR ↓	
[LEFT]	Cursor Left	SHIFT ← CRSR →	
[RIGHT]	Cursor Right	← CRSR →	
[SS]	Shifted Space	SHIFT Space	
[INSERT]	Insert	SHIFT INST/DEL	
[DEL]	Delete	INST/DEL	
[RVSON]	Reverse On	CNTRL 9	
[RVSOFF]	Reverse Off	CNTRL 0	
[UPARROW]	Up Arrow	↑	↑
[BACKARROW]	Back Arrow	←	←
[PI]	PI	π	π
[EP]	English Pound	£	£

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[BLACK]	Black	CNTRL 1	
[WHITE]	White	CNTRL 2	
[RED]	Red	CNTRL 3	
[CYAN]	Cyan	CNTRL 4	
[PURPLE]	Purple	CNTRL 5	
[GREEN]	Green	CNTRL 6	
[BLUE]	Blue	CNTRL 7	
[YELLOW]	Yellow	CNTRL 8	
[F1]	Function 1	F1	
[F2]	Function 2	SHIFT F1	
[F3]	Function 3	F3	
[F4]	Function 4	SHIFT F3	
[F5]	Function 5	F5	
[F6]	Function 6	SHIFT F5	
[F7]	Function 7	F7	
[F8]	Function 8	SHIFT F7	

BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent.* You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

Type NEW and begin entering an *Ahoy!* program. As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

C-64 BUG REPELLENT

```
10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=49152
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63)
:END
50 X=0:J=J+12:IFJ<49456THEN20
60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D
=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
90 POKE49456,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THE
ND=1:D$="TAPE"
100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (
0-99)";N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):
NEXTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
160 POKE770,131:POKE771,164:SYS49152:END
170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
240 DATA251,133,252,133,254,24,101,20,69,254,230,254,197
5
250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
280 DATA253,69,254,170,44,198,254,230,252,164,253,208,23
49
290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500
```

C-128 BUG REPELLENT

```
10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J
=4864
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65)
:END
50 X=0:J=J+12:IFJ<5213THEN20
60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D=
8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA
$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
90 POKE5213,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEN
D=1:D$="TAPE"
100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0
-99)";N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48
)
120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,
14):L=LEN(F$)
130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NE
XTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F
$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN6
0
160 POKE770,198:POKE771,77:SYS4864:END
170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
230 DATA169,0,166,235,164,236,133,253,133,254,142,47,193
2
240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
280 DATA69,254,170,44,198,254,230,252,164,251,208,213,23
07
290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1–SAVEs what you have entered so far.

f3–LOADs in a program worked on previously.

f5–To continue on a line you stopped on after LOADing in the previous saved work.

f7–Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. It temporarily freezes the output as well.

```
100 POKE53280,12:POKE53281,11                                   OP
105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";         FP
110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
]"                                                              JP
115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"            FA
120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.
[3" "]"                                                         AJ
125 FORA=54272TO54296:POKEA,0:NEXT                              ND
130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
KE54296,15                                                      NP
135 FORA=680TO699:READB:POKEA,B:NEXT                            FL
140 DATA169,251,166,253,164,254,32,216,255,96                   FF
145 DATA169,0,166,251,164,252,32,213,255,96                     EK
150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B             KP
155 GOSUB480:IFB=0THEN150                                       OE
160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16                   AM
165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B                    PE
170 GOSUB470:IFB=0THEN150                                       PG
175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                       GM
180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                      HG
185 POKE253,B:PRINT                                             EC
190 REM  GET HEX LINE                                           ED
195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8                    KD
200 FORB=0TO1:GOTO250                                           IH
205 NEXTB                                                       IJ
210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                       FA
215 PRINT" [c P][LEFT]";                                        EG
220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                       II
225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                      GL
230 NEXT                                                        GI
235 IFA%(8)<>TTHENGOSUB375:GOTO195                              FL
240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195               IM
245 REM    GET HEX INPUT                                        PA
250 GETA$:IFA$=""THEN250                                        GA
255 IFA$=CHR$(20)THEN305                                        GO
260 IFA$=CHR$(133)THEN535                                       LM
265 IFA$=CHR$(134)THEN560                                       IG
270 IFA$=CHR$(135)THENPRINT" ":GOTO620                          HO
275 IFA$=CHR$(136)THENPRINT" ":GOTO635                          HE
280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295                MI
285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295                DJ
290 GOSUB415:GOTO250                                            JA
295 PRINTA$"[c P][LEFT]";                                       PK
300 GOTO205                                                     FA
305 IFA>0THEN320                                                BI
310 A=-1:IFB=1THEN330                                           BB
315 GOTO220                                                     FA
320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                      BF
325 A=A-1                                                       FK
330 PRINTCHR$(20);:GOTO220                                      PH
335 REM LAST LINE                                               CP
340 PRINT" ":T=AD-(INT(AD/256)*256)                             KH
345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255                    OD
350 NEXT                                                        OB
355 IFA%(A)<>TTHENGOSUB375:GOTO195                              LH
360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                             BO
365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                      MB
370 REM BELL AND ERROR MESSAGES                                 LM
375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415         JK
380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415             PG
385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
5                                                               IK
390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
GOTO415                                                         HK
395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415              DM
400 PRINT"?ERROR IN SAVE":GOTO415                               JK
405 PRINT"?ERROR IN LOAD":GOTO415                               IO
410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                     JO
415 POKE54276,17:POKE54276,16:RETURN                            BF
420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN            DH
425 REM GET FOUR DIGIT HEX                                      IM
430 PRINT:PRINTB$;:INPUTT$                                      OL
435 IFLEN(T$)<>4THENGOSUB380:GOTO430                            JD
440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
380:GOTO430                                                     AK
445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN         KB
450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN                 GM
455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN                 NJ
460 T(A)=16:RETURN                                              IC
465 REM ADDRESS CHECK                                           OL
470 IFAD>ENTHEN385                                              HO
475 IFB<SRORB>ENTHEN390                                         LE
480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395                OB
485 RETURN                                                      HE
490 REM ADDRESS TO HEX                                          PM
495 AC=AD:A=4096:GOSUB520                                       AP
500 A=256:GOSUB520                                              NF
505 A=16:GOSUB520                                               LG
510 A=1:GOSUB520                                                HE
515 RETURN                                                      JD
520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530                  OC
525 A$=CHR$(T+48)                                               JI
530 PRINTA$;:AC=AC-A*T:RETURN                                   AA
535 A$="**SAVE**":GOSUB585                                      IC
540 OPEN1,T,1,A$:SYS680:CLOSE1                                  AB
545 IFST=0THENEND                                               FB
550 GOSUB400:IFT=8THENGOSUB420                                  PM
555 GOTO535                                                     FI
560 A$="**LOAD**":GOSUB585                                      PE
565 OPEN1,T,0,A$:SYS690:CLOSE1                                  PO
570 IFST=64THEN195                                              OI
575 GOSUB405:IFT=8THENGOSUB420                                  CO
580 GOTO560                                                     GN
585 PRINT" ":PRINTTAB(14)A$                                     KA
590 PRINT:A$="":INPUT"FILENAME";A$                              IO
595 IFA$=""THEN590                                              HK
600 PRINT:PRINT"TAPE OR DISK?":PRINT                            HL
605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN                NP
610 IFB$<>"T"THEN605                                            KO
615 RETURN                                                      PH
620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B                    DD
625 GOSUB475:IFB=0THEN620                                       NK
630 PRINT:GOTO195                                               HN
635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B                    FK
640 GOSUB475:IFB=0THEN635                                       LN
645 PRINT:GOTO670                                               HI
650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
OSUB410:GOTO195                                                 LM
655 PRINT" ";:NEXTB                                             LE
660 PRINT:AD=AD+8                                               CD
665 GETB$:IFB$=CHR$(136)THEN195                                 JD
670 GOSUB495:PRINT": ";:GOTO650                                 KE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81 and 82 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

JUNGLE JAKE
FROM PAGE 16

```
·10 REM JUNGLE JAKE (C)1987 CMB                  NC
·20 COLOR.,1:COLOR4,1:GRAPHIC1,1:GRAPHIC.
 :PRINTCHR$(11)CHR$(142)"[CLEAR][7"[DOWN]
 "]"TAB(14)"[c 1]GET READY":GOSUB750              HM
·30 PRINTTAB(11)"[3"[DOWN]"]HOLD YOUR HOR
 SES":RESTORE1070:A=3072:B=3072+767:FORX=
 ATOB:READA$:POKEX,DEC(A$):NEXT                   ME
·40 RESTORE1340:A=4864:B=5105:FORX=ATOB:R
 EADA$:POKEX,DEC(A$):NEXT:POKE4603,.:POKE
 4604,.                                           OJ
·50 PRINT"[CLEAR][DOWN][DOWN]"TAB(7)"[GRE
 EN][s U][24"[s C]"][s I]"                        BD
·60 PRINTTAB(7)"[s B][YELLOW][s U][22"[s
 C]"][s I][GREEN][s B]"                           IE
·70 PRINTTAB(7)"[s B][YELLOW][s B]  [GREE
 N][3"[c O]"]"SPC(17)"[YELLOW][s B][GREEN
 ][s B]"                                          HE
·80 PRINTTAB(7)"[s B][YELLOW][s B][3" "][
 GREEN][RVSON][c H][sEP][RVSOFF] [RVSON][
 c *][sEP][c *][RVSOFF] [RVSON][c *][sEP]
 [SS][SS][c *][c H][RVSOFF][SS][SS][RVSON
 ][sEP][c I][c F][RVSOFF] [YELLOW][s B][G
 REEN][s B]"                                      ME
·90 PRINTTAB(7)"[s B][YELLOW][s B][3" "][
 GREEN][RVSON][c H][c G][RVSOFF] [RVSON][
 c H][c H][RVSOFF][c *][RVSON][c *][SS][c
  H][RVSOFF][SS][SS][RVSON][c O][c H][RVS
 OFF]  [RVSON][SS][RVSOFF][c P]  [YELLOW]
 [s B][GREEN][s B]"                               ML
·100 PRINTTAB(7)"[s B][YELLOW][s B][GREEN
 ][RVSON][sEP][RVSOFF]  [RVSON][c H][c H]
 [RVSOFF] [RVSON][c H][c G][RVSOFF][SS][c
  *][RVSON][SS][c H][RVSOFF]  [RVSON][c F
 ][c H][RVSOFF]  [RVSON][SS][RVSOFF][c U]
   [YELLOW][s B][GREEN][s B]"                     JJ
·110 PRINTTAB(7)"[s B][YELLOW][s B][GREEN
 ][c *][RVSON][SS][SS][RVSOFF][sEP][c *][
 RVSON][SS][RVSOFF][sEP][c *][SS][SS][c *
 ][c *][RVSON][SS][SS][RVSOFF][sEP][RVSON
 ][c H][SS][c *][RVSOFF][c *][c I][RVSON]
 [c V][RVSOFF] [YELLOW][s B][GREEN][s B]"         HM
·120 PRINTTAB(7)"[s B][YELLOW][s B][GREEN
 ][22"[s C]"][YELLOW][s B][GREEN][s B]"           LH
·130 PRINTTAB(7)"[s B][YELLOW][s B][GREEN
 ][RVSON][6":"][SS]J[SS]A[SS]K[SS]E[SS][7
 ":"][RVSOFF][YELLOW][s B][GREEN][s B]"           EJ
·140 PRINTTAB(7)"[s B][YELLOW][s J][22"[s
 C]"][s K][GREEN][s B]"                           BL
·150 PRINTTAB(7)"[s J][24"[s C]"][s K]":P
 RINTTAB(10)"[DOWN][DOWN][c 4]A GAME FOR
 THE C-128":PRINTTAB(13)"[DOWN][s W]"TAB(
 19)"BY"TAB(26)"[s W]":PRINTTAB(9)"[DOWN]
 [c 5]CLEVELAND M. BLAKEMORE"                     OK
·160 CHAR.,10,23,"[GREEN]PRESS FIRE TO BE
 GIN!"                                            LH
·170 RESTORE1030:READJ$:PLAY"X0":VOL15:TE
 MPO25:G=LEN(J$):X=1:I=.:DO:PLAYMID$(J$,X
 ,1):X=X+1+(X=G)*G:LOOPUNTILJOY(2)>127:X=
 FRE(1)                                           JO
·180 CLR:DIM L(4),L,G,N,S,D,C,Y,B,F,H,P,I
 ,K,R,U,T,M,E,X,SC,HI,MN,LV,C(6),S(6),CS,
 S$(6),VIC                                        KD
·190 D=.:E=4595:F=127:H=10:P=15:I=5:K=25:
 R=319:U=1:T=2:M=3:LV=.:SC=.:MN=4:VIC=532
 48:HI=PEEK(4603)+(PEEK(4604)*256)                LC
·200 RESTORE670:FORX=.TO3:READL(X):NEXT:F
 ORX=.TO6:READC(X):NEXT:FORX=.TO6:READS(X
 ):NEXT:FORX=.TO6:READS$(X):NEXT                  HH
·210 DEFFNR(X)=RND(.)*I+T:DEFFND(X)=INT(R
 ND(.)*Y)*G+N                                     PA
·220 DEFFNJ(X)=(C<H)*M+(C=>H)*-M+(C=P)*M:
 DEFFNE(X)=((RSPPOS(U,.)<KANDL=U)OR(RSPPO
 S(U,.)>RAND(L=.ORL=T)))ANDD=.                    GN
·230 S$="[5"#"]":PUDEF"0":RESTORE990:READ
 LT$,D$,V1$,V2$,J$,RS$,VC$                        GA
·240 B$="[RVSON]":F$=B$:FORX=.TO39:F$=F$+
 " ":B$=B$+CHR$(160):NEXT:V$="[c 2]":FORX
 =.TO11:V$=V$+"([DOWN][LEFT])[DOWN][LEFT]
 ":NEXT:M$=" [s Q] [s Q] [s Q] [s Q]":DH$
 ="[HOME][DOWN][4"[RIGHT]"][RED]":CL$=CHR
 $(27)+"Q"                                        BA
·250 CP$="[c 5][RVSOFF][4"[c @]"][DOWN][4
 "[LEFT]"][RVSON][s U][c T][c T][s I][DOW
 N][4"[LEFT]"][c J][c @][c @][c L][DOWN][
 4"[LEFT]"][s J][c O][c O][s K]"                  CL
·260 SK$="[c 4][RVSON][s U][3"[c Y]"][s I
 ][DOWN][5"[LEFT]"][c J][s W]"+CHR$(160)+
 "[s W][c L][DOWN][5"[LEFT]"][s J][c S]"+
 CHR$(34)+CHR$(27)+CHR$(27)+"[RVSON][c A]
 [s K][DOWN][4"[LEFT]"][3"[cEP]"][DOWN][3
 "[LEFT]"][s J][c I][s K]":S$="[5"#"]":PU
 DEF"0":TEMPO10                                   KO
·270 MOVSPR7,16,77:MOVSPR8,28,52:POKE2046
 ,56:POKE2047,57:SPRITE7,.,2,.,1,.,1:SPRI
 TE8,.,9,.,.,.,1:SPRCOLOR10,12                    FL
·280 POKE4592,48:POKE4593,222:POKE4594,24
 :POKE4602,65:POKE4600,7                          LO
·290 PLAYRS$:VOL15:GOSUB450:PLAYV1$:PLAYV
 2$:PLAYD$                                        EB
·300 L=.:POKEVIC+21,255:FORX=.TOI:B=BUMP(
 U):B=BUMP(T):NEXT:POKE4595,1:SYS4864             MB
·310 REM MAIN LOOP                                CB
·320 DO:IFFNE(.)THENGOSUB410:ELSEIFDTHENM
 OVSPRU,+.,+D:C=C+U:D=FNJ(.):ELSEMOVSPRU,
 +.,L(L):IFJOY(T)>FTHEND=-U:C=.:SOUNDU,E,
 K,.,R,R,.                                        OC
```

```
·330 MOVSPRFNR(.),FND(.)#S:B=BUMP(U):LOOP
 UNTILBANDU                                BO
·340 IF(BANDF+T)=F+TTHENBEGIN:POKEE,.:POK
 E2047,58:MOVSPRU,37,55:PRINTDH$"[s S]":S
 C=SC+(LV+U)*1000:GOSUB420:PLAYRS$:FORX=.
 TOM:PLAYLT$:NEXT                          MP
·350 IFLV<6THENLV=LV+U:POKEVIC+21,127:PRI
 NTDH$"[s A]":SLEEP2:GOTO290               CG
·360 SLEEP2:POKEVIC+21,129:CHAR.,12,.,"[c
 8]CONGRATULATIONS"+CL$:CHAR.,9,1,"JUNGL
 E JAKE [WHITE]CHAMPION!"+CL$:PLAYRS$:PLA
 YVC$:PLAYVC$:SLEEP4:POKEVIC+21,.:GOTO400  HK
·370 BEND                                  IM
·380 POKEE,.:POKE4592,U:SPRITEU,U,8,,,,.:
 POKE2040,59:SOUND1,60000,150,1,20000,400
 0,.:MOVSPRU,.#U:CHAR.,29+MN*T,U,"[RED][s
 W]":MN=MN-U:M$=LEFT$(M$,T*MN):SLEEP3:PL
 AYRS$                                     IO
·390 PLAYD$:POKEVIC+21,.:IFMNTHENGOSUB460
 :GOSUB420:POKE4592,48:GOTO300             FB
·400 PLAYRS$:IFHITHENPOKE4604,INT(HI/256)
 :POKE4603,HI-INT(HI/256)*256:RUN50:ELSER
 UN50                                      DG
·410 POKEE,.:FORX=L(L)TOL(L+U)STEP-U:MOVS
 PRU,+.,X:NEXT:POKEE,U:L=L+U:SC=SC+100*((
 LV+U)*L)                                  CD
·420 COLOR5,C(LV):CHAR.,7,24,"[RVSON]":PR
 INTUSINGS$;SC:IFSC>HITHENHI=SC            ML
·430 CHAR.,34,24,"[RVSON]":PRINTUSINGS$;H
 I:RETURN                                  OB
·440 REM DRAW GAME SCREEN                  DH
·450 POKEVIC+21,.:PRINT"[CLEAR]"CHR$(27)"
 M";:CHAR.,5,10,SK$:CHAR.,30,10,SK$:PRINT
 "[RED]":CHAR.,20-LEN(S$(LV))/2,12,S$(LV)
 :SLEEP1:TEMPO30:PLAYJ$:TEMPO10            NH
·460 PRINT"[CLEAR]":CHAR.,.,2,CP$:COLOR5,
 C(LV):CHAR.,.,6,F$:CHAR.,.,12,F$:CHAR.,.
 ,18,F$:CHAR.,.,24,B$:CHAR.,1,24,"SCORE":
 CHAR.,31,24,"HI":GOSUB420                 AH
·470 CHAR.,15,24,"[RVSON]JUNGLE[RIGHT]JAK
 E[RVSOFF]":CHAR.,31,.,"[c 4]LEVEL[WHITE]
 ":PRINTLV+1;"[c 5]":CHAR.,30,1,M$:CHAR.,
 38,6,LEFT$(V$,19):CHAR.,1,12,LEFT$(V$,19
 ):CHAR.,38,18,LEFT$(V$,19)                AF
·480 FORX=1TO6:MOVSPRX,.#.:NEXT:POKE2040,
 48:POKE2047,58:MOVSPR1,30,221:SPRITE1,1,
 9,.,.,.,.,1:SPRITE8,1:D=.:C=.             PI
·490 ONLV+1GOSUB500,510,520,530,540,550,5
 60:SLEEP1:RETURN                          AP
·500 CS=6:S=2:GOSUB610:GOSUB570:GOSUB580:
 RETURN                                    MB
·510 CS=11:S=2:GOSUB620:GOSUB570:GOSUB590
 :RETURN                                   AH
·520 CS=8:S=1:GOSUB610:GOSUB570:GOSUB580:
 RETURN                                    OD
·530 CS=9:S=3:GOSUB630:GOSUB640:GOSUB570:
 GOSUB600:RETURN                           GG
·540 CS=13:S=2:GOSUB610:GOSUB570:GOSUB580
 :RETURN                                   BA
·550 CS=7:S=2:GOSUB640:GOSUB570:GOSUB600:
 RETURN                                    FH
·560 CS=16:S=2:GOSUB610:GOSUB570:GOSUB580
 :RETURN                                   NF
·570 FORX=2TO6:SPRITEX,.,CS,.,.,.,.,1:POKE2
 039+X,S(LV):NEXT:RETURN                   LO
·580 Y=2:G=180:N=90:RETURN                 OP
·590 Y=360:G=1:N=.:RETURN                  IJ
·600 Y=2:G=180:N=.:RETURN                  HC
·610 FORX=2TO5:MOVSPRX,170,L(X-2)-1:NEXT:
 MOVSPR6,170,L(3)-1:RETURN                 GM
·620 FORX=2TO6:MOVSPRX,170,60:NEXT:RETURN  FJ
·630 FORX=.TO4:CHAR.,6+X*6,.,V$:NEXT:RETU
 RN                                        DC
·640 FORX=.TO4:MOVSPR2+X,72+X*48,60:NEXT:
 RETURN                                    HD
·650 RETURN                                BK
·660 REM LEVEL Y-COORDS                    ML
·670 DATA 222,174,126,78                   AE
·680 REM LEVEL COLORS                      HG
·690 DATA 6,12,6,5,4,8,3                   PL
·700 REM LEVEL SHAPES                      HA
·710 DATA 53,55,54,52,53,55,54             GO
·720 REM LEVEL DESCRIPTIONS                KO
·730 DATA BITE IN THE ASP,FOR THE BIRDS,Z
 ULU COUNTRY,MONKEY BUSINESS,SNAKE YOUR B
 ODY,PECKERS FROM ABOVE,HEADSHRINKER HEAV
 EN!                                       AO
·740 REM REDEFINED CHARACTERS              CK
·750 RESTORE770:BANK15:SUM=0:FORI=2816TO2
 869:READJ:SUM=SUM+J:POKEI,J:NEXT:IFSUM<>
 7491THENPRINT"ERROR!":END:ELSESYS2816:PO
 KE2604,PEEK(2604)AND240OR8                IL
·760 READA:IFA=-1THENRETURN:ELSEFORI=.TO7
 :READB:POKE8192+A*8+I,B:NEXT:GOTO760      HN
·770 DATA 169,,133,250,133,252,169,208     EC
·780 DATA 133,251,169,32,133,253,169,252   DH
·790 DATA 141,185,2,169,16,141,54,11       FD
·800 DATA 160,,169,250,162,14,32,116       OO
·810 DATA 255,162,,32,119,255,200,208      KM
·820 DATA 241,206,54,11,240,7,230,251      GB
·830 DATA 230,253,76,26,11,96              EI
·840 REM CHARACTER DATA                    IL
·850 DATA40,48,96,48,24,140,198,236,24     ML
·860 DATA41,12,6,12,24,49,99,55,24         PG
·870 DATA65,54,111,119,123,54,12,8,.       ND
·880 DATA81,24,24,126,189,153,36,66,195    HM
·890 DATA86,231,231,255,60,60,255,231,231  JE
·900 DATA87,66,195,60,90,126,36,219,66     DB
·910 DATA160,219,126,60,255,,,,.           KL
·920 DATA186,255,60,195,231,231,195,60,25
 5                                         DH
·930 DATA201,,,,224,240,248,248,248        AA
·940 DATA202,31,31,31,15,7,,,.             JF
·950 DATA203,248,248,248,240,224,,,.       KC
·960 DATA213,,,,7,15,31,31,31              OJ
·970 DATA-1                                KL
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81 and 82 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
•980 REM MUSIC DATA                            AP
•990 DATA "V105H$BV303Q$ESGV205S$ES$EV303
SGIGV205I$EV302IFV105Q$AV302IF03Q$EV204Q
GV105QGV105WFV303QF04S$AV205SCSCV304S$AI
$AV205ICV304ICICQ$AV205QC"                     MF
•1000 DATA "V103HGV202HGV301HGQGV206HFV1H
$AV301SBIBSB02SDV206WFV1WGV302IDSDSGIGSG
DSGIGSG"                                        PH
•1010 DATA "V204I$EV105QCV304ICICV2I$EI$E
V105QDV304ICICV2I$EI$EV105Q$EV304ICICV2I
$EI$EV105QDV304ICICV2I$EI$EV105QCV304ICI
CV2I$EI$EV104Q$AV304ICICV2I$E"                  MI
•1020 DATA "V304ICV2I$EV1IGI$EV2ICV3SR02.
I#FV204ICV1I$EI$EV2ICV302IG03.ICV204ICV1
I$EI$EV2ICV303.I$EV204ICV1I$EI$EV2ICV303
I#F"                                            AL
•1030 DATA "V101C00A01HD00.AQBV101C00A01H
D00.AQB01HCFEDQV101C00A01HD00.AQ"               IE
•1040 DATA "V1T0X0V2T0X0V3T1X0U15"               IA
•1050 DATA "V302W$BV203WGV106HCH$EHDV203H
FV3HD02H$BV203H$BV106QC05Q$BV106W$EV204H
CV302H$B04H$E02H$BV203HD"                       IL
•1060 REM SPRITE DATA                           MB
•1070 DATA 0,55,,1,55,40,,FB,,,EA,80,,EE,
80,,AB,,,55,,1,55,40,5,75,58,15,55,5A           EJ
•1080 DATA 14,75,1A,14,55,,28,FF,,28,55,5
0,9,55,54,5,40,54,15,,14,94,,14,90,,14,A
0,,2A                                           JO
•1090 DATA 0,,,,,55,,1,55,40,,FB,,,EA,80,
,EE,80,,AB,,,55,,1,55,,5,75                     OF
•1100 DATA 40,5,55,40,5,75,A0,1,95,80,,AF
,80,,A5,,,55,40,,55,40,9,51,40,9,51,40,8
,1                                              FD
•1110 DATA 40,8,2,A0,,,,,,55,,1,55,40,,EF
,,2,AB,,2,BB,,,EA,,,55,,                        CA
•1120 DATA 55,40,1,5D,50,1,55,50,A,5D,50,
2,56,40,2,FE,,,5A,,1,55,,1,55,,1,45,60,1 FN
•1130 DATA 45,60,1,40,20,A,80,20,,,,,,55,
,1,55,40,,EF,,2,AB,,2,BB,,,EA,                  FN
•1140 DATA 0,55,,1,55,40,25,5D,50,A5,55,5
4,A4,5D,14,,55,14,,FF,28,5,55,28,15,55,6
0,15,1,50                                       MI
•1150 DATA 14,,54,14,,16,14,,6,A8,,A,,,,,
80,14,,80,55,,90,B5,80,56,A5,80,16,A5           HE
•1160 DATA 0,5,54,,81,55,,81,55,40,95,55,
40,15,15,40,,15,40,,15,40,,55,10,81,54,4
,85,50                                          KG
•1170 DATA 1,95,40,1,95,,1,,44,,10,,,,,
,,,,,,,,F,,,1A,40,                              AG
•1180 DATA 2A,80,,2A,80,,A,,,2,40,,,90,,,
A0,,2,90,,A,40,,2A,1,,A4,8,2                    MA
•1190 DATA A0,20,A,40,28,2A,,A,A4,,1,AA,,
2,2A,66,65,A,AA,A8,2,AA,A0,,20,20,,20,AF
,                                               OK
•1200 DATA A8,1A,C0,20,FB,C0,10,FF,C0,10,
3F,C0,10,,C0,10,3F,F0,1C,F,F0,3F,FF,F0,3
F,FF,F0,3C,F,F0                                 IF
•1210 DATA 10,A,AC,10,A,AC,10,A,AC,10,F,3
F,10,F,3F,10,3F,F,10,3F,F,10,FC,3F,2,F0,
BC,,80,                                         PP
•1220 DATA 2,A0,,A,A8,,2A,2A,,A8,2A,AA,A8
,A,AA,A0,2,96,80,,EB,,,69,,,AA,,,28             AA
•1230 DATA 0,,28,,,,,,,,,,,,,,,,,,,,,,,,,
,,                                              EF
•1240 DATA 0,,,,,,,,,,,,,,,,,,,,,,,,,,,,, AM
•1250 DATA 0,,,,,,,,,,,,,,,,,,,,,,,,,28,,
99,,1                                           KJ
•1260 DATA DD,80,E,66,70,,20,FF,8,8F,FF,F
2,81,55,42,A1,AA,4A,51,EB,45,55,AA,55,54
,BE,15,50,BE,5                                  PE
•1270 DATA 51,55,45,55,5D,55,15,55,54,5,5
D,50,5,55,50,1,5D,40,,FF,,,FF,,1,55,40,5
,55,50                                          DO
•1280 DATA 5,55,50,5,55,50,5,55,50,,,FF,,
F,FF,F0,1,55,40,1,AA,40,1,EB,40,5,AA,50,
4,EB                                            FK
•1290 DATA 10,,BE,,1,55,40,5,5D,50,15,A6,
94,15,AE,94,15,95,94,1,5D,40,,FF,,,FF,,1
,55                                             NF
•1300 DATA 40,5,55,50,5,55,50,5,55,50,5,5
5,50,,,7E,,,81,,,7E,,10,,8,38,7E,1C,7C          HJ
•1310 DATA DB,3E,FE,7E,7F,FF,42,FF,FE,5A,
7F,F5,BD,AF,E3,C3,C7,E3,BD,C7,E3,B5,C7,E
3,BD,C7,73,B5,CE,33                             HG
•1320 DATA 81,CC,11,7E,88,,E7,,,E7,,1,E7,
80,1,C3,80,1                                    EJ
•1330 REM INTERRUPT DATA                        MB
•1340 DATA 78,A9,16,8D,14,3,A9,13,8D,15,3
,AD,F8,11,85,FB,A9,1,85,FC,58,60,AD,F3,1
1,D0,3,4C,87,13                                 CI
•1350 DATA AD,,DC,29,F,85,FD,A9,F,38,E5,F
D,C9,4,D0,1B,A9,32,8D,F9,11,AD,D6,11,38,
E9,1,8D,D6,11                                   CK
•1360 DATA B0,8,A9,1,4D,E6,11,8D,E6,11,4C
,65,13,C9,8,D0,3A,A9,30,8D,F9,11,AD,D6,1
1,18,69,1,8D,D6                                 OJ
•1370 DATA 11,90,8,A9,1,4D,E6,11,8D,E6,11
,C6,FB,10,1E,AD,F8,11,85,FB,A5,FC,18,6D,
F9,11,8D,F8,7,A5                                BH
•1380 DATA FC,18,69,39,8D,FF,7,C6,FC,10,4
,A9,1,85,FC,AD,E6,11,29,1,D0,12,AD,D6,11
,38,CD,F2,11,B0                                 AI
•1390 DATA 18,AD,F2,11,8D,D6,11,4C,AF,13,
AD,D6,11,38,CD,FA,11,90,6,AD,FA,11,8D,D6
,11,A2,7,8E,F4,11                               MB
•1400 DATA AD,F4,11,A,AA,E8,BD,D6,11,38,C
D,F0,11,B0,9,AD,F0,11,9D,D6,11,4C,DB,13,
BD,D6,11,38,CD,F1                               BF
•1410 DATA 11,90,6,AD,F1,11,9D,D6,11,CE,F
4,11,30,3,4C,B4,13,EE,F5,11,AD,F5,11,29,
6,8D,2D,D0,4C,65,FA,D2                          FO
```

REPETITIVE PROCESSES
FROM PAGE 32

ITERATIVE SOLUTIONS (C-128)

```
·1 REM ================================== IH
·2 REM       ITERATIVE SOLUTIONS          NP
·3 REM        RUPERT REPORT #49           ML
·4 REM                                    JF
·5 REM          C-128 VERSION             MH
·6 REM ================================== MO
·10 DEF FNA(X)=X*X-3                      BA
·20 X0=0 : X=1        :REM INITIAL VALUES FH
·30 DO                                    AL
·40 : DELTA=(X-X0)/(1-FNA(X0)/FNA(X))     KD
·50 : X0=X                                PO
·60 : X=X-DELTA                           OJ
·70 : PRINT X,FNA(X)                      DE
·80 LOOP WHILE ABS(DELTA) > 0.0001        FE
·90 END                                   NK
·100 REM ================================
 ====================== C-64 VERSION === ML
·110 REM DELETE LINE 30                   DF
·120 REM CHANGE LINE 80 AS FOLLOWS        PD
·130 IF ABS(DELTA) > 0.0001 THEN 40       KK
```

ITERATIVE DESIGNS (C-128)

```
·1 REM ================================== IH
·2 REM        ITERATIVE DESIGNS           GF
·3 REM        RUPERT REPORT #49           ML
·4 REM                                    JF
·5 REM          C-128 VERSION             MH
·6 REM ================================== MO
·10 G0=RGR(0) : IF G0=6 THEN G0=5         GD
·20 GRAPHIC 0 : GRAPHIC 1,1               LL
·30 FOR X=0 TO 319                        AN
·40 S=1+TAN(0.005*X)                      DM
·50 FOR Y=0 TO 199 STEP S                 BD
·60 DRAW 1,X,Y                            FB
·70 NEXT Y                                CD
·80 NEXT X                                CO
·90 GETKEY A$                             FG
·100 GRAPHIC G0 :REM RESTORE MODE         MG
```

ITERATIVE DESIGNS (C-64)

```
·1 REM ==============================     PA
·2 REM      ITERATIVE DESIGNS 64          PC
·3 REM          C-64 VERSION              IF
·4 REM        RUPERT REPORT #49           OO
·5 REM                                    JC
·9 REM ======  FOR C-64 ONLY!  =======    LF
·10 GOSUB 1000 :REM INITIALIZE GRAPHICS   MK
·30 FOR X=0 TO 319                        AN
·40 S=1+TAN(0.005*X)                      DM
·50 FOR Y=0 TO 199 STEP S                 BD
·60 GOSUB 2000  :REM SET PIXEL AT X,Y     FF
·70 NEXT Y                                CD
·80 NEXT X                                CO
·90 GET A$ : IF A$="" THEN 90             JE
·100 GOSUB 3000                           LA
·110 END                                  OO
·950 REM ******************************** AG
·960 REM                                  FA
·970 REM >>> INITIALIZE BIT MAP MODE <<<  MD
·980 REM                                  GE
·990 REM  SET & RESET BIT FUNCTIONS       FH
·1000 DEF FNSB(N)=PEEK(MM) OR 2[UPARROW]N IL
·1010 DEF FNRB(N)=PEEK(MM) AND (255-2[UPA
RROW]N)                                   MA
·1020 VV=53248 :REM VIC-II REGISTER 0     OC
·1030 :REM >>> PUT BIT MAP AT 8192 <<<
     (SET BIT 3 OF VIC REGISTER 24)       PO
·1040 MM=VV+24 : POKE MM,FNSB(3)          HG
·1050 :REM >>> SELECT BIT MAP MODE <<<
     (SET BIT 5 OF VIC REGISTER 17)       EP
·1060 MM=VV+17 : POKE MM,FNSB(5)          IK
·1070 BASE=8192 :REM START BIT MAP MEMORY MH
·1080 :REM >>> CLEAR BIT MAP <<<          KK
·1090 GOSUB 4000                          JJ
·1100 :REM > SELECT COLORS C1 AND C0   <  MI
·1110 C1=1 : C0=0 : CC=16*C1 + C0         FG
·1120 :REM FILL SCREEN MEMORY WITH COLOR  MB
·1130 FOR MM=1024 TO 2023:POKE MM,CC:NEXT FI
·1140 RETURN                              AG
·1150 :                                   LM
·1970 REM ============================    AP
·1980 REM > TURN ON PIXEL AT (X,Y) <<<    CI
·1990 REM ============================    KD
·2000 BIT=7-(X AND 7)                     NG
·2010 MM=BASE+320*INT(Y/8)+8*INT(X/8)+(Y
AND 7)                                    EM
·2020 POKE MM,FNSB(BIT)                   LH
·2030 RETURN                              ID
·2040 :                                   DJ
·2970 REM ==========================      HL
·2980 REM >>> RESET BIT MAP MODE <<<      CL
·2990 REM ==========================      AP
·3000 MM=VV+17 : POKE MM,FNRB(5)          LA
·3010 REM  RESTORE SCREEN MEMORY BASE     FL
·3020 MM=VV+24 : POKE MM,FNRB(3)          CM
·3030 RETURN                              GP
·3960 :                                   MB
·3970 ============================        LC
·3980 >>> CLEAR BIT MAP SCREEN <<<        JC
·3990 ============================        BO
·4000 FOR M=828 TO 828+43                 BK
·4010 READ B : POKE M,B                   AP
·4020 CK=CK+B                             IC
·4030 NEXT                                EP
·4040 IF CK<>5133 THEN PRINT "DATA ERROR
IN LINES 4060 - 4110" : STOP              JD
·4050 SYS 828: RETURN                     OF
```

```
·4060 DATA 76,68,3,0,32,31,64,0            BP
·4070 DATA 173,63,3,133,251,173,64,3       FA
·4080 DATA 133,252,174,65,3,160,0,173      GD
·4090 DATA 67,3,136,145,251,208,251,230    CF
·4100 DATA 252,202,48,7,208,244,172,66     BG
·4110 DATA 3,208,239,96                    NL
```

TEXTSAVE
FROM PAGE 20

TEXTSAVE LOADER

```
·100 REM TEXTSAVE LOADER                   CD
·110 SA=2816:REM RELOCATABLE               FN
·120 CK=0:BANK15                           HO
·130 FORI=0TO252:READML$:ML=DEC(ML$):CK=C
K+ML:POKESA+I,ML:NEXT                      IC
·140 IFCK<>35500THENPRINT"DATA ERROR[3"!"
]":END                                     FP
·150 PRINT"TEXTSAVE INSTALLED"SA"TO"SA+25
3:NEW                                      AN
·160 DATA 24,D7,10,01,60,85,16,86          LH
·170 DATA 17,A8,F0,0F,C0,05,90,03          ND
·180 DATA 4C,28,7D,A9,00,18,69,30          EF
·190 DATA 88,D0,FB,A8,A9,1E,A2,12          PL
·200 DATA 20,CC,CD,98,E8,20,CC,CD          GO
·210 DATA A0,1A,A6,17,D0,16,B9,E0          NJ
·220 DATA 00,20,CA,CD,88,10,F7,A0          GA
·230 DATA 0D,B9,54,03,20,CA,CD,88          EK
·240 DATA 10,F7,30,14,20,D8,CD,99          CJ
·250 DATA E0,00,88,10,F7,A0,0D,20          DK
·260 DATA D8,CD,99,54,03,88,10,F7          EO
·270 DATA A9,D8,85,C4,A9,00,85,C3          PA
·280 DATA A9,00,A4,16,F0,06,18,69          FN
·290 DATA 06,88,D0,FB,A2,12,20,CC          OL
·300 DATA CD,98,E8,20,CC,CD,A6,17          BG
·310 DATA D0,24,B1,C3,0A,0A,0A,0A          FK
·320 DATA 85,DB,E6,C4,B1,C3,29,0F          LI
·330 DATA 05,DB,C6,C4,20,CA,CD,C8          LM
·340 DATA D0,E8,A5,C4,C9,DA,F0,24          BK
·350 DATA E6,C4,E6,C4,D0,DC,E6,C4          NA
·360 DATA 20,D8,CD,91,C3,4A,4A,4A          NL
·370 DATA 4A,C6,C4,91,C3,E6,C4,C8          PL
·380 DATA D0,EE,A5,C4,C9,DB,F0,04          OO
·390 DATA E6,C4,D0,E2,A9,04,85,C4          DA
·400 DATA A9,E8,85,AE,A9,07,85,AF          OC
·410 DATA A6,17,D0,18,B1,C3,20,CA          CO
·420 DATA CD,E6,C3,D0,02,E6,C4,A5          ML
·430 DATA C3,C5,AE,D0,EB,A5,C4,C5          BJ
·440 DATA AF,D0,E5,60,20,D8,CD,91          PH
·450 DATA C3,B8,50,E5,84,17,A8,8A          CM
·460 DATA A2,12,20,CC,CD,98,E8,20          EM
·470 DATA CC,CD,B8,50,CB                   HG
```

TEXTSAVE DEMO

```
·100 REM TEXTSAVE DEMO                     JA
·110 TS=2816                               JJ
·120 BANK15:IFPEEK(TS)<>36THENPRINT"TEXTS
AVE NOT IN MEMORY[3"!"]":END               HG
·130 PRINTCHR$(27)"M";:REM NO SCROLLING    BO
·140 SCNCLR0                               KA
·150 M$="SCREEN":S=0:L=24:T=3              FI
·160 GOSUB420:REM FILL FIRST SCREEN        JH
·170 SYS TS,S,0:REM STORE IT               KG
·180 UC=3:UR=3:LC=24:LR=12:REM UPPER AND
LOWER COLUMN AND ROW                       GA
·190 L=7:T=1                               FF
·200 REM OPEN 4 WINDOWS AND SAVE EACH SCR
EEN                                        FN
·210 FORS=1TO4                             GF
·220 IFS=2ORS=4THENPRINT"[RVSON]";         EE
·230 GOSUB360:GOSUB420                     HD
·240 SYS TS,S,0                            AP
·250 GOSUB450:PRINT"[RVSOFF]";             PK
·260 NEXT                                  IH
·270 SLEEP2                                EN
·280 GOSUB430:UC=1:UR=8:LC=38:LR=14:PRINT
"[RVSON]";:GOSUB360                        MG
·290 PRINT"[RVSOFF][DOWN][DOWN] PRESS A K
EY TO RESTORE EACH SCREEN";                HK
·300 POKE2594,64:REM NO KEYS REPEAT        LF
·310 FORS=4TO 0 STEP-1                     EA
·320 GETKEY A$:SYS TS,S,1:REM WAIT FOR KE
YPRESS, RECALL SCREENS                     FN
·330 NEXT                                  MN
·340 POKE2594,255:PRINTCHR$(27)"L";:REM E
NABLE KEY REPEAT, SCROLLING                MN
·350 SLEEP2:END                            FG
·360 WINDOW UC,UR,LC,LR:REM OUTSIDE WINDO
W                                          EM
·370 PRINT"[c A]";:FORI=UC+1TO LC-1:PRINT
"[s *]";:NEXT:PRINT"[c S]";                AC
·380 FORI=UR+1TOLR-1:PRINT"[s -]";TAB(LC-
UC):PRINT"[s -]";:NEXT                     HB
·390 PRINT"[c Z]";:FORI=UC+1TO LC-1:PRINT
"[s *]";:NEXT:PRINT"[c X]";                ME
·400 WINDOW UC+1,UR+1,LC-1,LR-1,1:REM INS
IDE WINDOW                                 AJ
·410 RETURN                                CJ
·420 FORI=0TO L:GOSUB430:FORR=0TO T:COLOR
5,C:PRINTM$;S,:NEXT:NEXT:RETURN            FO
·430 C=INT(RND(0)*16)+1:IFC=RCLR(0)THEN43
0:REM NEW COLOR                            EB
·440 RETURN                                EH
·450 UC=UC+3:UR=UR+3:LC=LC+3:LR=LR+3:RETU
RN:REM NEW WINDOW POSITION                 HC
```

ICE TITANS
FROM PAGE 18

Starting address in hex: C000
Ending address in hex: CDCA
SYS to start: 49152

***Flankspeed* required for entry! See page 83.**

```
C000: A9 00 8D 21 D0 8D 15 D0 9C
C008: 8D 17 D0 8D 1D D0 8D 1B A1
C010: D0 8D 1C D0 8D AC 02 A9 41
C018: 06 8D 20 D0 20 28 C6 20 CB
C020: 42 C6 A0 27 A9 A0 99 98 6D
C028: 07 A9 03 99 98 DB 88 10 82
C030: F3 A9 12 20 D2 FF A9 9F 1C
C038: 20 D2 FF A2 16 8E AA 02 1F
C040: AE AA 02 A0 27 18 20 F0 8C
C048: FF A9 20 20 D2 FF AE AA 5E
C050: 02 CA 8E AA 02 E0 04 D0 0E
C058: E7 A2 18 A0 01 18 20 F0 C5
C060: FF A9 7A A0 CA 20 1E AB D9
C068: A2 18 A0 1C 18 20 F0 FF 09
C070: A9 89 A0 CA 20 1E AB A2 9B
C078: 0F A0 07 18 20 F0 FF A9 02
C080: 96 A0 CA 20 1E AB A9 B7 CD
C088: A0 C9 20 1E AB 20 65 C6 29
C090: 20 70 C7 A2 11 A0 0A 18 5F
C098: 20 F0 FF A9 B1 A0 CA 20 90
C0A0: 1E AB EE 86 02 20 A8 C2 6D
C0A8: D0 E9 20 AE C2 20 65 C6 41
C0B0: A9 00 8D 15 D0 8D AB 02 09
C0B8: 8D B2 02 20 98 C8 AD 2D 57
C0C0: C8 8D A9 02 A9 03 8D B0 AD
C0C8: 02 8D B1 02 A9 AA 8D 00 ED
C0D0: D0 A9 D4 8D 01 D0 A9 36 5F
C0D8: 8D 02 D0 A9 96 8D 03 D0 DA
C0E0: A2 29 8E 0C C8 8E FA 07 A0
C0E8: E8 8E F8 07 8E 0A C8 A2 64
C0F0: 21 8E FB 07 8E 0D C8 E8 F0
C0F8: 8E F9 07 8E 0B C8 A2 F0 7E
C100: 8E 32 C8 A9 01 2D 10 D0 42
C108: 09 02 8D 10 D0 A9 01 8D B9
C110: 29 D0 8D 2A D0 20 05 C2 7A
C118: AD AB 02 AA A0 07 BD 6A ED
C120: C8 99 F8 07 99 0A C8 BD AC
C128: 73 C8 99 27 D0 BD 36 C8 B2
C130: 99 02 C8 88 C0 03 D0 E6 98
C138: A9 07 8D A7 02 AD A7 02 77
C140: A8 0A AA B9 FA C7 0A A8 CC
C148: B9 BC C7 9D CE C7 E8 C8 6C
C150: B9 BC C7 9D CE C7 CE A7 39
C158: 02 10 E2 AD AB 02 18 0A CA
C160: 0A 18 69 0C 8D AF 02 A9 E0
C168: 03 8D 15 D0 20 32 C2 AD A1
C170: 1E D0 AD 1E D0 20 32 C2 11
C178: AD 1E D0 8D AD 02 A2 00 F4
C180: 20 24 C4 A2 01 20 24 C4 36
C188: 20 A8 C2 D0 03 20 41 C2 0C
C190: 20 01 C5 20 18 C2 20 4A DC
C198: C4 20 65 C5 20 F6 C3 20 A3
C1A0: 45 C3 20 C7 C2 AD 8D 02 91
C1A8: D0 FB A2 00 A0 08 CA D0 5C
C1B0: FD 88 D0 FA EE D4 DB AD 50
C1B8: B0 02 D0 08 A9 FE 2D 15 2F
C1C0: D0 8D 15 D0 AD B1 02 D0 37
C1C8: 1A A9 FD 2D 15 D0 8D 15 40
C1D0: D0 AD B0 02 D0 0D A9 00 89
C1D8: 8D 15 D0 A9 20 8D D4 07 7F
C1E0: 4C 77 C0 AD AF 02 D0 8D 23
C1E8: AD AB 02 C9 08 F0 03 EE F8
C1F0: AB 02 A2 64 20 80 C8 20 2F
C1F8: C4 C8 A9 03 8D 15 D0 20 C6
C200: 89 C6 4C E0 C0 AE B0 02 9F
C208: BD 7C C8 8D 27 D0 AE B1 F0
C210: 02 BD 7C C8 8D 28 D0 60 FB
C218: A0 0F B9 00 D0 99 E0 C7 94
C220: 88 10 F7 A0 07 B9 B4 C7 8E
C228: 2D 10 D0 99 F2 C7 88 10 23
C230: F4 60 AD 11 D0 10 FB 60 81
C238: A9 FE 85 A2 A5 A2 D0 FC 1F
C240: 60 AD 15 D0 29 01 F0 32 81
C248: AD 15 D0 29 04 D0 2B AD B2
C250: 00 D0 8D 04 D0 AD 01 D0 03
C258: 38 E9 0A 8D 05 D0 AD 10 A5
C260: D0 AA 29 FB A8 8A 29 01 5E
C268: F0 04 98 09 04 A8 98 8D D1
C270: 10 D0 AD 15 D0 09 04 8D 7F
C278: 15 D0 AD 15 D0 29 02 F0 0E
C280: 26 AD 15 D0 29 08 D0 1F 5B
C288: AD 02 D0 38 E9 0A 8D 06 C8
C290: D0 AD 03 D0 8D 07 D0 AD F5
C298: 10 D0 09 08 8D 10 D0 AD A6
C2A0: 15 D0 09 08 8D 15 D0 60 6B
C2A8: AD 00 DC 29 10 60 A2 16 85
C2B0: 8E AA 02 AE AA 02 A0 24 0C
C2B8: 20 01 EA AE AA 02 CA 8E 79
C2C0: AA 02 E0 06 D0 ED 60 AD 21
C2C8: B2 02 D0 09 AD 15 D0 29 14
C2D0: F0 C9 F0 D0 01 60 AD AF 0C
C2D8: 02 F0 FA A0 07 8C AA 02 A7
C2E0: B9 B4 C7 2D 15 D0 D0 4E 49
C2E8: A9 FF 38 F9 B4 C7 2D 10 7E
C2F0: D0 8D 10 D0 AE AB 02 BD 4A
C2F8: 6A C8 99 F8 07 99 0A C8 32
C300: BD 73 C8 99 27 D0 A9 05 3A
C308: 99 3F C8 8D B2 02 98 AA 2F
C310: 0A A8 A9 0A 99 00 D0 99 7A
C318: E0 C7 BD 5F C8 C8 99 00 09
C320: D0 99 E0 C7 AC AA 02 A9 36
C328: 00 99 F2 C7 B9 B4 C7 0D BF
C330: 15 D0 8D 15 D0 60 AC AA 41
C338: 02 88 C0 03 F0 06 8C AA B4
C340: 02 4C E0 C2 60 AD AD 02 EF
C348: C9 0C D0 01 60 29 0F D0 59
C350: 01 60 29 0C 4D 15 D0 8D A7
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C358: 15 D0 A9 07 8D AA 02 AC D5
C360: AA 02 A9 04 18 79 B4 C7 C8
C368: CD AD 02 D0 03 4C B2 C3 7C
C370: AC AA 02 A9 08 18 79 B4 C1
C378: C7 CD AD 02 D0 03 4C B2 90
C380: C3 AC AA 02 A9 01 18 79 D9
C388: B4 C7 CD AD 02 D0 09 CE 2B
C390: B0 02 20 05 C2 4C B2 C3 ED
C398: AC AA 02 A9 02 18 79 B4 E3
C3A0: C7 CD AD 02 D0 09 CE B1 40
C3A8: 02 20 05 C2 4C B2 C3 4C A1
C3B0: DB C3 A9 2B 99 F8 07 99 58
C3B8: 0A C8 A9 01 99 27 D0 20 E7
C3C0: 2E C7 AE AB 02 E8 20 80 9C
C3C8: C8 AC AA 02 A9 FF 38 F9 C6
C3D0: B4 C7 2D 15 D0 8D 15 D0 D3
C3D8: CE AF 02 AC AA 02 88 C0 FB
C3E0: 03 F0 06 8C AA 02 4C 5F BF
C3E8: C3 20 32 C2 AD 1E D0 20 7E
C3F0: 32 C2 AD 1E D0 60 CE A9 5B
C3F8: 02 D0 25 AD 2D C8 8D A9 CB
C400: 02 A2 07 BD B4 C7 2D 32 45
C408: C8 F0 15 BD 0A C8 18 7D FC
C410: 1A C8 9D F8 07 DE 1A C8 52
C418: 10 06 BD 12 C8 9D 1A C8 47
C420: CA 10 E0 60 AD 00 DC 29 EF
C428: 0F 8D AA 02 A9 0F 38 ED 50
C430: AA 02 A8 B9 22 C8 F0 11 2C
C438: 8D A8 02 A8 B9 B3 C7 3D 8B
C440: 67 C8 F0 05 8A A8 20 60 1A
C448: C4 60 A9 07 8D A7 02 AC 02
C450: A7 02 B9 FA C7 F0 06 8D FA
C458: A8 02 20 60 C4 4C F8 C4 52
C460: B9 B4 C7 2D 69 C8 D0 10 D6
C468: AD A8 02 0A AA BD BC C7 B7
C470: 08 98 0A AA 28 4C 7E C4 7D
C478: 98 0A AA BD CE C7 30 1A 64
C480: F0 39 B9 02 C8 18 7D 00 C4
C488: D0 9D 00 D0 90 2D B9 B4 F3
C490: C7 0D 10 D0 8D 10 D0 4C 01
C498: BB C4 BD 00 D0 38 F9 02 DB
C4A0: C8 9D 00 D0 B0 15 B9 B4 0C
C4A8: C7 4D 10 D0 8D 10 D0 A9 B6
C4B0: FF 38 F9 B4 C7 2D 10 D0 6D
C4B8: 8D 10 D0 B9 B4 C7 2D 69 F3
C4C0: C8 D0 12 AD A8 02 0A AA 79
C4C8: E8 BD BC C7 08 98 0A AA 49
C4D0: E8 28 4C DC C4 98 0A AA 1D
C4D8: E8 BD CE C7 30 0F F0 17 5D
C4E0: B9 02 C8 18 7D 00 D0 9D 69
C4E8: 00 D0 4C F7 C4 BD 00 D0 51
C4F0: 38 F9 02 C8 9D 00 D0 60 BC
C4F8: CE A7 02 30 03 4C 4F C4 05
C500: 60 A9 07 8D AA 02 AC AA A2
C508: 02 AD AD 02 39 B4 C7 F0 0E
C510: 45 AD 1B D4 29 03 AA BD 87
C518: 2E C8 8D A8 02 48 8A 48 62
C520: 98 48 20 60 C4 68 A8 68 BF
C528: AA 68 0A AA 98 0A A8 BD F8
C530: BC C7 99 CE C7 E8 C8 BD 54
C538: BC C7 99 CE C7 B9 E0 C7 4F
C540: 99 00 D0 88 B9 E0 C7 99 2F
C548: 00 D0 AE AA 02 AD 10 D0 03
C550: 1D F2 C7 8D 10 D0 AE AA EF
C558: 02 CA E0 03 F0 06 8E AA 39
C560: 02 4C 06 C5 60 A2 07 8E 13
C568: A7 02 AC A7 02 98 0A AA B5
C570: B9 B4 C7 2D 34 C8 D0 03 A4
C578: 4C 1F C6 B9 B4 C7 2D 10 1E
C580: D0 D0 2B BD 00 D0 38 C9 DD
C588: 32 90 11 B9 3F C8 C9 05 EC
C590: D0 0A A9 19 99 3F C8 A9 79
C598: 00 8D B2 02 BD 00 D0 38 A1
C5A0: D9 3F C8 B0 38 B9 3F C8 2D
C5A8: 9D 00 D0 4C BD C5 BD 00 A4
C5B0: D0 38 D9 47 C8 90 26 B9 14
C5B8: 47 C8 9D 00 D0 B9 B4 C7 6D
C5C0: 2D 35 C8 F0 0C A9 FF 38 CA
C5C8: F9 B4 C7 2D 15 D0 8D 15 F4
C5D0: D0 BD CE C7 F0 07 49 FF 37
C5D8: 09 01 9D CE C7 E8 BD 00 BD
C5E0: D0 38 D9 4F C8 B0 09 B9 4F
C5E8: 4F C8 9D 00 D0 4C FF C5 81
C5F0: BD 00 D0 38 D9 57 C8 90 42
C5F8: 26 B9 57 C8 9D 00 D0 B9 21
C600: B4 C7 2D 35 C8 F0 0C A9 4E
C608: FF 38 F9 B4 C7 2D 15 D0 C9
C610: 8D 15 D0 BD CE C7 F0 07 CF
C618: 49 FF 09 01 9D CE C7 CE 6E
C620: A7 02 30 03 4C 6A C5 60 D9
C628: A9 D5 85 FA A9 C8 85 FB 1C
C630: A0 00 B1 FA F0 0B 20 D2 6C
C638: FF C8 D0 F6 E6 FB 4C 32 2A
C640: C6 60 A9 C6 85 FA A9 CA CC
C648: 85 FB A9 40 85 FC A9 08 E7
C650: 85 FD A2 03 A0 00 B1 FA C6
C658: 91 FC 88 D0 F9 E6 FB E6 04
C660: FD CA D0 F2 60 A2 18 A9 B1
C668: 00 9D 00 D4 CA 10 FA A9 5A
C670: F0 8D 06 D4 A9 11 8D 04 16
C678: D4 A9 0F 8D 18 D4 A9 81 AB
C680: 8D 12 D4 A9 FF 8D 0F D4 10
C688: 60 20 65 C6 A0 03 A9 55 D7
C690: 8D 0C D4 8D 0D D4 8D 13 0F
C698: D4 8D 14 D4 A9 21 8D 0B 47
C6A0: D4 A9 11 8D 12 D4 A9 18 66
C6A8: 85 02 A9 C7 85 03 A2 06 D2
C6B0: 8A 48 A2 00 A1 02 8D 08 5F
C6B8: D4 8D AA 02 E8 A1 02 8D E1
C6C0: 07 D4 E8 A1 02 8D 0F D4 9A
C6C8: E8 A1 02 8D 0E D4 AD AA 1E
C6D0: 02 C9 32 D0 08 A9 F0 85 C7
C6D8: A2 A5 A2 D0 FC A9 FA 85 BB
C6E0: A2 A5 A2 D0 FC A5 02 18 59
C6E8: 69 04 85 02 A5 03 69 00 EF
C6F0: 85 03 68 AA CA F0 05 8A D7
```

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C6F8: 48 4C B2 C6 A9 20 8D 0B 69
C700: D4 A9 10 8D 12 D4 A9 E6 93
C708: 85 A2 A5 A2 D0 FC 88 F0 BF
C710: 03 4C 8E C6 20 65 C6 60 61
C718: 19 1E 12 D1 21 87 19 1E 13
C720: 2A 3E 1F A5 32 3C 25 A2 83
C728: 2A 3E 1F A5 32 3C A9 80 ED
C730: 8D 0B D4 A9 0F 8D 08 D4 C0
C738: A9 05 8D 07 D4 A9 F0 8D 78
C740: 0D D4 A9 00 8D 0C D4 A9 E3
C748: 81 8D 0B D4 A9 0F 8D AE 2C
C750: 02 20 38 C2 20 01 C4 AC FF
C758: AE 02 8C 08 D4 98 18 69 8C
C760: 80 8D 0C D4 88 8C AE 02 15
C768: D0 E7 A9 80 8D 0B D4 60 19
C770: A9 09 8D 0C D4 8D 00 D4 F3
C778: 8D 01 D4 A9 F5 8D 05 D4 E2
C780: A9 1F 8D 06 D4 A9 21 8D 0A
C788: 04 D4 A9 21 8D 0B D4 A0 3A
C790: 32 A2 64 8A 48 A2 FF CA 0A
C798: D0 FD 68 AA 8E 08 D4 8E 74
C7A0: 01 D4 8C 07 D4 CA D0 EB 66
C7A8: 88 D0 E6 A9 20 8D 04 D4 19
C7B0: 8D 0B D4 60 01 02 04 08 8D
C7B8: 10 20 40 80 00 00 00 FF A9
C7C0: 01 FF 01 00 01 01 00 01 C5
C7C8: FF 01 FF 00 FF FF 00 00 C9
C7D0: 00 00 00 00 00 00 00 00 D0
C7D8: 00 00 00 00 00 00 00 00 D8
C7E0: 00 00 00 00 00 00 00 00 E0
C7E8: 00 00 00 00 00 00 00 00 E8
C7F0: 00 00 00 00 00 00 00 00 F0
C7F8: 00 00 00 00 01 07 08 04 0D
C800: 06 02 04 03 04 06 01 01 1B
C808: 01 01 00 00 00 00 00 00 0A
C810: 00 00 01 01 01 01 01 01 16
C818: 01 01 00 00 00 00 00 00 1A
C820: 00 00 00 01 05 00 07 08 35
C828: 06 00 03 02 04 0F 02 04 4C
C830: 06 08 FC 01 FF 0C 01 02 4B
C838: 02 03 03 04 04 04 05 1E 6F
C840: 19 19 19 19 19 19 19 1E 0E
C848: 39 39 39 39 39 39 39 56 2F
C850: 5A 56 56 56 56 56 56 D6 87
C858: BE D6 D6 D6 D6 D6 D6 00 20
C860: 00 00 00 5A 79 9C C0 44 D5
C868: 11 F0 23 23 25 27 23 25 45
C870: 27 25 27 03 0F 0D 0E 03 14
C878: 0E 06 04 0E 00 0B 0C 01 B6
C880: A0 04 38 B9 C7 07 69 00 4F
C888: C9 3A 90 02 A9 30 99 C7 5A
C890: 07 88 10 EF CA D0 E9 60 06
C898: A0 00 B9 C7 07 D9 E1 07 84
C8A0: F0 05 B0 0B 4C BA C8 C8 EA
C8A8: C0 06 90 EE 4C BA C8 A0 5F
C8B0: 05 B9 C7 07 99 E1 07 88 49
C8B8: 10 F7 A0 05 A9 30 99 C7 A1
C8C0: 07 88 10 FA AD AB 02 18 CE
C8C8: 69 31 09 80 8D D4 07 A9 FF
C8D0: 01 8D D4 DB 60 08 8E 93 9A
C8D8: 9F 12 20 20 20 20 20 20 4B
C8E0: 20 20 20 20 20 20 20 20 E1
C8E8: 20 20 20 20 20 20 20 20 E9
C8F0: 20 20 20 20 20 20 20 20 F1
C8F8: 20 20 20 20 20 20 20 20 F9
C900: 20 20 20 20 20 20 20 20 01
C908: 20 20 20 20 20 20 20 20 09
C910: 20 20 20 20 20 20 20 20 11
C918: 92 A9 DF 12 20 20 20 20 C6
C920: 20 20 20 20 20 20 20 20 21
C928: 20 20 20 20 20 20 20 92 9B
C930: A9 DF A9 DF 12 20 20 92 28
C938: A9 DF 12 20 20 20 20 20 74
C940: 20 92 A9 DF 12 20 20 92 61
C948: A9 20 20 DF A9 DF 12 20 CD
C950: 20 92 A9 DF A9 DF 12 20 48
C958: 20 92 A9 DF 12 20 20 20 07
C960: 20 20 92 A9 20 20 20 20 5D
C968: DF A9 20 20 DF 12 20 20 64
C970: 92 A9 DF A9 20 20 DF A9 FF
C978: 20 20 20 20 20 20 DF A9 C2
C980: 20 20 20 20 DF A9 20 20 CA
C988: DF 12 20 A0 20 92 A9 20 B7
C990: 20 20 20 20 20 20 20 20 91
C998: 20 DF A9 20 20 20 20 20 E2
C9A0: 20 20 20 20 20 20 20 20 A1
C9A8: 20 20 20 20 20 20 20 20 A9
C9B0: 20 20 20 DF 12 20 00 13 36
C9B8: 11 11 11 11 11 11 11 11 41
C9C0: 92 20 20 20 9C B0 C3 C3 88
C9C8: C3 C3 C3 C3 C3 C3 C3 C3 E6
C9D0: C3 C3 C3 C3 C3 C3 C3 C3 EE
C9D8: C3 C3 C3 C3 C3 C3 C3 C3 F6
C9E0: C3 C3 C3 C3 C3 AE 0D 20 8F
C9E8: 20 20 C2 9A BC 12 BB AC BD
C9F0: 92 BE 12 20 A2 92 BE 12 7A
C9F8: 20 C3 C3 92 20 20 BC 12 42
CA00: BB AC 92 BE 12 BB AC 92 C6
CA08: BC 12 BB AC 92 BE 12 AC 4F
CA10: BB 92 B6 12 20 DF B6 AC 8A
CA18: A2 92 BE 9C C2 0D 20 20 B8
CA20: 20 C2 9A AC 12 BE BC 92 6A
CA28: BB 12 20 92 A2 BB 12 20 39
CA30: C3 C3 92 20 20 20 12 A1 5E
CA38: 92 A1 20 12 BE BC 92 20 CC
CA40: 12 A1 92 A1 20 12 AC BB C2
CA48: 92 B6 A1 DF 12 B6 C3 C3 63
CA50: 92 A1 9C C2 0D 20 20 20 51
CA58: AD C3 C3 C3 C3 C3 C3 C3 60
CA60: C3 C3 C3 C3 C3 C3 C3 C3 7E
CA68: C3 C3 C3 C3 C3 C3 C3 C3 86
CA70: C3 C3 C3 C3 C3 C3 C3 C3 8E
CA78: BD 00 92 9A 53 43 4F 52 9B
CA80: 45 20 30 30 30 30 30 30 07
CA88: 00 05 48 49 47 48 20 30 FE
CA90: 30 30 30 30 30 00 9A 42 5E
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81 and 82 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
CA98: 59 20 43 4C 45 56 45 4C CE
CAA0: 41 4E 44 20 4D 2E 20 42 72
CAA8: 4C 41 4B 45 4D 4F 52 45 FA
CAB0: 00 50 52 45 53 53 20 46 A5
CAB8: 49 52 45 20 54 4F 20 42 BF
CAC0: 45 47 49 4E 21 00 00 00 06
CAC8: 00 00 00 00 00 00 00 00 C8
CAD0: 00 00 00 00 00 00 00 00 D0
CAD8: 00 00 00 00 00 00 04 92 6F
CAE0: 40 06 DB 60 0B 6D B0 02 8E
CAE8: 49 20 00 00 00 00 00 00 52
CAF0: 00 00 00 00 00 00 00 00 F0
CAF8: 00 00 00 00 00 00 00 00 F8
CB00: 00 00 00 00 00 EF 00 00 EF
CB08: 00 00 00 00 00 00 00 00 08
CB10: 00 00 00 00 00 00 00 0F 1F
CB18: 00 00 1F 00 0E 3F 00 0E 92
CB20: 3F 00 0F FF 00 0F FF 00 7D
CB28: 0F FF 00 0E 3F 00 0E 3F D1
CB30: 00 00 1F 00 00 0F 00 00 5E
CB38: 00 00 00 00 00 00 00 00 38
CB40: 00 00 00 00 00 00 51 83 15
CB48: 05 F1 39 05 61 FF 07 79 5F
CB50: BB 02 A1 93 02 A0 FE 06 EA
CB58: A1 7D 87 97 83 CB 89 FE 6E
CB60: 32 40 31 C6 26 32 2A 19 66
CB68: 32 12 01 B2 02 00 B3 FA 11
CB70: 1F B0 0A 20 33 CA 27 B6 46
CB78: 52 12 78 A2 09 01 40 04 46
CB80: 83 F0 3F C0 00 FF 01 83 79
CB88: 00 39 39 00 61 FF 05 79 DA
CB90: BB 05 A1 93 07 A0 FE 02 2F
CB98: A1 7D 82 97 83 C6 89 FE A4
CBA0: 3E 40 31 C7 26 32 2F 19 B8
CBA8: 32 12 01 32 02 3E 31 FA 8C
CBB0: 40 30 0A 40 31 EA 27 B6 65
CBB8: 52 12 78 A2 09 01 42 3F C3
CBC0: 82 82 00 07 F2 FF 00 FF BF
CBC8: 00 01 18 80 42 7E 42 A2 08
CBD0: 5A 45 D2 7E 4B AA 3C 55 49
CBD8: A5 18 A5 A3 81 C5 C0 42 2A
CBE0: 03 60 24 02 10 18 0C 0C AA
CBE8: 24 30 02 18 40 01 3C 80 55
CBF0: 00 99 00 00 99 00 00 80 A4
CBF8: 80 00 80 80 00 80 80 03 7E
CC00: 01 00 07 FE 00 FF 00 FF 07
CC08: 00 01 18 80 42 7E 42 A2 47
CC10: 5A 45 D2 7E 4B AA 3C 55 88
CC18: A5 18 A5 A3 81 C5 C0 42 69
CC20: 03 60 24 02 10 18 0C 0C E9
CC28: 24 30 02 18 40 01 3C 80 94
CC30: 00 99 00 00 99 00 01 01 65
CC38: 00 01 01 00 01 01 00 01 3D
CC40: 01 80 00 FF C0 FF 03 81 07
CC48: C0 07 00 E0 0E 00 70 0E 7D
CC50: 00 70 0F 7E F0 07 FF E0 27
CC58: 02 DB 40 02 66 40 06 3C 61
CC60: 60 06 5A 60 07 18 E0 07 88
CC68: E7 E0 03 E7 C0 01 FF 80 5E
CC70: 00 FF 00 00 C3 00 00 FF 34
CC78: 00 00 7E 00 00 3C 00 00 33
CC80: 18 00 00 00 00 00 03 81 1D
CC88: C0 07 00 E0 0E 00 70 0E BD
CC90: 00 70 0F 7E F0 07 FF E0 67
CC98: 02 DB 40 02 66 40 06 3C A1
CCA0: 60 06 5A 60 07 18 E0 07 C8
CCA8: E7 E0 03 E7 C0 01 FF 80 9E
CCB0: 00 E7 00 00 C3 00 00 C3 20
CCB8: 00 09 66 90 00 3C 00 24 19
CCC0: 18 24 80 00 01 00 00 00 7E
CCC8: 00 00 00 00 00 00 00 00 C8
CCD0: 10 00 00 0C 00 00 38 00 25
CCD8: 00 10 00 00 0C 00 00 38 2D
CCE0: 00 00 10 00 00 0C 00 00 FC
CCE8: 38 00 00 10 00 00 0C 00 3D
CCF0: 00 38 00 00 10 00 00 0C 45
CCF8: 00 00 18 00 00 10 00 00 21
CD00: 00 00 00 00 00 FF 00 00 FF
CD08: 00 00 00 00 00 00 00 00 08
CD10: 00 00 00 00 00 00 00 00 10
CD18: 00 00 00 00 00 00 00 00 18
CD20: 00 00 00 00 00 00 00 00 20
CD28: 00 00 00 FF 80 00 FF 80 29
CD30: 00 3E 00 00 3E 00 00 FF AC
CD38: 80 01 FF C0 03 FF E0 03 61
CD40: FF E0 03 FF E0 03 00 00 08
CD48: 00 00 00 00 00 00 00 00 48
CD50: 00 00 00 00 00 00 00 00 50
CD58: 00 00 00 00 24 00 00 01 7D
CD60: 00 01 54 00 00 29 00 00 DE
CD68: 94 80 00 2A 00 01 54 80 7D
CD70: 00 12 00 00 28 00 00 00 AA
CD78: 00 00 00 00 00 00 00 00 78
CD80: 00 00 00 00 00 00 80 00 01
CD88: 01 00 08 80 28 20 04 01 5F
CD90: 09 40 4A 40 10 01 09 00 7E
CD98: 12 00 54 08 48 00 02 25 76
CDA0: 44 28 92 10 00 25 00 52 27
CDA8: 42 4A 00 11 10 29 44 00 C3
CDB0: 00 2A 94 15 00 00 00 28 AC
CDB8: 14 45 00 80 08 44 24 00 03
CDC0: 91 00 20 00 01 00 00 00 73
CDC8: FF 00 FF C8
```

CLONE-A-MATIC

FROM PAGE 30

```
·10 REM *** CLONE-A-MATIC *** BUCK CHILDR
 ESS ***                                   HA
·20 REM *** P.O. BOX 13575, SALEM, OR  97
 309 ***                                   MJ
```

```
·30 PRINT"[CLEAR]LOADING DATA[3"."]":FORJ=53000TO53182:READA:POKEJ,A:X=X+A:NEXTJ DA
·40 IFX<>28499THENPRINT"[DOWN]ERROR IN DATA[3"."]":END KK
·50 POKE808,234:POKE52,32:POKE56,32 CM
·60 CLR:PRINT"[CLEAR][DOWN]INSERT SOURCE DISK";:GOSUB250 IG
·70 PRINT"[DOWN][DOWN]NAME OF FILE (PRESS $ FOR" KL
·80 INPUT"THE DIRECTORY)";N$ IM
·90 IFN$="$"THENSYS53087:GOTO70 PD
·100 IFLEN(N$)<1ORLEN(N$)>16THENPRINT"[DOWN]1 TO 16 CHARACTERS[3"."]":GOTO70 LG
·110 INPUT"[DOWN]TYPE OF FILE - PRG/SEQ/USR (P/S/U)";T$ EM
·120 IFT$<>"P"ANDT$<>"S"ANDT$<>"U"THEN110 LB
·130 GOSUB290:IFER=1THEN220 CC
·140 OPEN5,8,5,N$+","+T$+",R":GOSUB300:IFER=1THEN220 BG
·150 PRINT"[DOWN]READING[3"."]":SYS53000:GOSUB300:CLOSE5:CLOSE15:IFER=1THEN220 FK
·160 IFPEEK(252)>206THENPRINT"[DOWN]FILE TOO LONG TO COPY[3"."]":GOTO220 GA
·170 PRINT"[DOWN][DOWN]INSERT BACKUP DISK";:POKE198,0:GOSUB250 HI
·180 GOSUB290:IFER=1THEN220 CM
·190 OPEN5,8,5,N$+","+T$+",W":GOSUB300:IFER=1THEN220 CP
·200 PRINT"[DOWN]WRITING[3"."]":SYS53043:GOSUB300:CLOSE5:CLOSE15:IFER=1THEN220 KP
·210 PRINT"[DOWN][DOWN]COPY COMPLETE[3"."]" AF
·220 INPUT"[DOWN][DOWN]COPY ANOTHER FILE (Y/N)";F$ HE
·230 IFF$="Y"THEN60 EP
·240 GOTO280 BG
·250 PRINT", THEN PRESS RETURN.":PRINT"PRESS Q TO QUIT." LN
·260 GETA$:IFA$=CHR$(13)THENRETURN KL
·270 IFA$<>"Q"THEN260 EA
·280 POKE52,160:POKE56,160:CLR:POKE808,237:END IB
·290 OPEN15,8,15:PRINT#15,"I" PE
·300 INPUT#15,EN$,EM$,ET$,ES$:IFEN$="00"THENRETURN JB
·310 PRINT"[DOWN]"EN$","EM$","ET$","ES$:CLOSE5:CLOSE15:ER=1:RETURN OF
·320 DATA169,0,162,32,133,251,133,253,134,252,134,254 EC
·330 DATA162,5,32,198,255,32,207,255,160,0,145,251 GC
·340 DATA165,144,208,12,230,251,208,241,230,252,165,252 AG
·350 DATA201,207,144,233,76,204,255,169,54,133,1,162 KJ
·360 DATA5,32,201,255,160,0,177,253,32,210,255,165 CN
·370 DATA253,197,251,208,13,165,254,197,252,208,7,169 HF
·380 DATA55,133,1,76,204,255,230,253,208,226,230,254 IJ
·390 DATA76,60,207:REM END COPY ROUTINE...BEGIN DIRECTORY IE
·400 DATA169,147,32,210,255,169,36,133,251,169,5,162 IN
·410 DATA8,160,0,32,186,255,169,1,162,251,160,0 HF
·420 DATA32,189,255,32,192,255,162,5,32,198,255,32 GI
·430 DATA207,255,32,207,255,32,207,255,32,207,255,32 KP
·440 DATA207,255,72,32,207,255,168,104,170,165,144,240 MD
·450 DATA8,32,204,255,169,5,76,195,255,152,32,205 DC
·460 DATA189,169,32,32,210,255,32,225,255,240,234,32 HK
·470 DATA207,255,208,243,169,13,32,210,255,184,80,201 AK
```

INFOFLOW 64
FROM PAGE 70

```
·10 REM INFOFLOW 64 (C)1987 "[s C][s M][s B]" FH
·20 POKE53280,11:POKE53281,. DB
·30 V=53248:SPBASE=49152+1016:S=54272:JP=56320:DEFFNJF(V)=((PEEK(JP)AND16)=.) OL
·40 DEFFNM(V)=INT(V/RL%):PLOT=53180 AB
·50 NF$="[DOWN][c 5] [s N]O [s F]ILE IN [s M]EMORY!":FE$="[DOWN][c 5][s F]ILE [s C]URRENTLY IN [s M]EMORY!":Q$="[RVSON][s Q][s U][s I][s T]  " JN
·60 DIMBO(7):FORI=.TO7:BO(I)=2[UPARROW]I:NEXT:CR$=CHR$(13) LE
·70 GOSUB2010 KE
·80 POKEV+21,.:POKEV+16,16:FORI=.TO7:POKESPBASE+I,32+I:NEXT:POKEV+39,15 JL
·90 FORI=V+40TOV+46:POKEI,6:NEXT:FORI=51200TO51711:READA:POKEI,A:NEXT EH
·100 FORI=VTOV+15:READA:POKEI,A:NEXT EC
·110 FORI=53000TO53223:READA:POKEI,A:NEXT:SYS53000 DJ
·120 B$="[CLEAR][c 7][RVSON] *[12" "][s I]NFO[s F]LOW 64[13" "]* " HG
·130 GOSUB140:GOTO220 AJ
·140 PRINTB$:PRINTTAB(2)"[6"[DOWN]"][s S]AVE"SPC(6)"[s N]EW"SPC(6)"[s D]ELETE"SPC(4)"[s V]IEW/[s A]DD" JF
·150 PRINTTAB(2)"[s L]OAD"SPC(6)"[s F]ILE"SPC(5)"[s R]ECORD"SPC(4)"[s R]ECORD[DOWN]" II
·160 FORX=.TO39:PRINT"[c @]";:NEXT:PRINT:PRINTTAB(32)"[DOWN][c A][c R][c S][DOWN][3"[LEFT]"][c Q][s +][c W][DOWN][LEFT][L
```

```
EFT][c E][c X]"                                       MH
•170 PRINTTAB(2)"[DOWN][s S]ORT"SPC(6)"[s
 S]EARCH"SPC(3)"[s H]ARDCOPY"SPC(2)"[s C
 ]URRENT"                                             KM
•180 PRINTTAB(31)"[s R]ECORD"                         BO
•190 PRINT"[DOWN][DOWN][c 5][RVSON] * (C)
 1987 [s B]Y [s C]LEVELAND [s M]. [s B]LA
 KEMORE  * ";                                         PO
•200 PRINTSPC(3)"[RVSOFF][c 4][s S][s P][
 s A][s C][s E] [s I][s N] [s M][s E][s M
 ][s O][s R][s Y] [s F][s O][s R] [WHITE]
 [4"0"][c 4] [s R]ECORDS!":PRINTTAB(15)"[
 BLUE]";Q$;"[HOME]"                                   GF
•210 POKEV+16,16:POKEV,160:POKEV+1,115:PO
 KEV+21,255:RETURN                                    PD
•220 WAITJP,16,16                                     CI
•230 C=PEEK(V+30):C=PEEK(V+30)AND254:FORI
 =1TO7:IFBO(I)=CTHENC=I                               PB
•240 NEXT                                             HC
•250 ONCGOSUB300,620,800,1080,1220,1380,1
 430                                                  EO
•260 X=PEEK(V):I=PEEK(V+1)                            PE
•270 IF(PEEK(V+16)AND1)=1ANDX>8ANDX<60AND
 I>150ANDI<187THENGOSUB1620:GOTO220                   GG
•280 IFI<235THEN220                                   HF
•290 WAITJP,16,.:SYSPLOT,15,24:PRINT"[c 7
 ]";Q$"[LEFT][LEFT]?";:GOSUB1740:GOSUB174
 0:GOSUB1740                                          PK
•295 IFFNJF(.)=.ANDUSR(.)=.THEN295                    HK
•296 IFFNJF(.)THENPOKE648,4:POKE679,.:SYS
 679                                                  MH
•297 SYSPLOT,15,24:PRINT"[BLUE]";Q$;:GOTO
 220                                                  JD
•300 REM SAVE/LOAD FILE                               FK
•310 GOSUB1810                                        IK
•320 OPEN15,8,15:CLOSE15                              JH
•330 IFST<>.THENPRINT"[CLEAR][s D][s R][s
  I][s V][s E] [s O][s F][s F] [s L][s I]
 [s N][s E]!":GOSUB1830:GOSUB1780:GOSUB17
 50:RETURN                                            FO
•340 POKE198,0:PRINT"[RVSON][c 8][s S][RV
 SOFF]AVE OR [RVSON][s L][RVSOFF]OAD?"                LO
•350 WAIT198,1:GETA$:IFA$<>"L"ANDA$<>"S"T
 HENGOSUB1780:RETURN                                  PE
•360 IFA$="L"THEN470                                  MC
•370 REM SAVE FILE TO DISK                            BK
•380 IFEF=.THENPRINTNF$:GOSUB1830:GOSUB17
 80:GOSUB1750:RETURN                                  PP
•390 PRINT"[CLEAR][c 8][s S][s A][s V][s
 I][s N][s G][SS][s F][s I][s L][s E][BLU
 E] ";FT$:A$=FT$                                      BP
•400 OPEN15,8,15,"S:[s I][s F]]"+A$:CLOSE
 15:OPEN2,8,2,"[s I][s F]]"+A$+",S,W"                 AG
•410 J=EF-1:PRINT#2,RL%;CR$;TL;CR$;J;CR$;
 N;CR$;FT$                                            BC
•420 FORX=1TON:PRINT#2,N$(X);CR$;L%(X):NE
 XT                                                   NK
•430 FORJ=1TOEF-1:FORI=1TON:PRINT#2,R$(J,
 I):NEXTI,J                                           CF
•440 CLOSE2:OPEN15,8,15:INPUT#15,DS,DS$:C
 LOSE15:PRINT"[WHITE]"DS$:GOSUB1830                   EJ
•450 GOTO600                                          NL
•460 REM LOAD FILE                                    JM
•470 IFEFTHENPRINTFE$:GOSUB1830:GOSUB1780
 :RETURN                                              PI
•480 PRINT"[DOWN][c 8][s F]ILENAME:[BLUE]
 ";:A=12:GOSUB1930:A$=IN$                             LL
•490 CLOSE2:OPEN2,8,2,"[s I][s F]]"+A$+",
 S,R"                                                 KO
•500 CLOSE15:OPEN15,8,15:INPUT#15,A,DS$:I
 FA>.THEN600                                          ON
•510 INPUT#2,RL%,TL,EF,N,FT$                          MF
•520 DIMR$(TL,N),N$(N),L%(N)                          OI
•530 FORI=1TON:INPUT#2,N$(I):INPUT#2,L%(I
 )                                                    DF
•540 NEXT                                             KA
•550 FORJ=1TOEF                                       BA
•560 FORI=1TON                                        NN
•570 GET#2,A$:IFA$<>CR$THENR$(J,I)=R$(J,I
 )+A$:GOTO570                                         HI
•580 NEXTI,J:EF=EF+1:CR=1                             CI
•590 CLOSE2:INPUT#15,DS,DS$                           PO
•600 PRINT"[WHITE]"DS$;:CLOSE15:GOSUB1830             PB
•610 GOSUB1780:GOSUB1750:RETURN                       BF
•620 REM INITIALIZE NEW FILE                          ML
•630 GOSUB1810:IFEFTHENPRINT"[DOWN][DOWN]
 ";FE$:GOSUB1830:GOSUB1780:GOSUB1750:RETU
 RN                                                   BG
•640 RL%=.:TL=.:PRINT"[c 8] [s F]ILENAME:
 [BLUE]";:A=10:GOSUB1930:FT$=IN$                      MJ
•650 PRINT"[s N]UMBER OF FIELDS:";:A=2:GO
 SUB1930:N=VAL(IN$):IFN<1ORN>22THEN650                JN
•660 DIMN$(N),L%(N)                                   GG
•670 FORX=1TON:PRINT"[s N]AME [s F]IELD #
 ";X;"[LEFT]:";:A=39:GOSUB1930:N$(X)=IN$              BF
•680 A$="":PRINT"[s L]ENGTH [s F]IELD #";
 X;"[LEFT]:";:A=3:GOSUB1930:A$=IN$                    BO
•690 IFVAL(A$)>.ANDVAL(A$)<255THENL%(X)=A
 BS(VAL(A$)):GOTO710                                  HG
•700 PRINT"[s D]EFAULT (160) !":L%(X)=160             BL
•710 RL%=RL%+L%(X):NEXT                               LJ
•720 RL%=RL%+3*(N+1)+5:TL=FNM(FRE(.)):EF=
 2:DIMR$(TL,N)                                        MN
•730 PRINT"[s T]HIS FILE WILL PERMIT AT L
 EAST"                                                LO
•740 PRINTFNM(FRE(.));" [s R]ECORDS."                 FK
•750 PRINT"[DOWN][RVSON][s A][RVSOFF]CCEP
 T OR [RVSON][s R][RVSOFF]EJECT?"                     ID
•760 GETA$:IFA$<>"A"ANDA$<>"R"THEN760                 GK
•770 IFA$="R"THENRUN                                  HG
•780 PRINT"[DOWN][c 7][s E]MPTY [s F]ILE
 [s C]REATED.";:CR=1:EF=1:GOSUB1830:GOSUB
 1780:GOSUB1750                                       LL
•790 RETURN                                           KH
•800 REM DELETE RECORD(S)                             NP
•810 GOSUB1810:IFEF=.THENPRINTNF$:GOSUB18
```

```
30:GOSUB1780:GOSUB1750:RETURN              CH
·820 PRINT"[c 8][RVSON][s C][RVSOFF]URREN
T [s R]ECORD, [RVSON][s S][RVSOFF]CAN [s
 F]ILE, [RVSON][s A][RVSOFF]LL OR [RVSON
][s E][RVSOFF]XIT?"                        JI
·830 GETA$:IFA$<>"E"ANDA$<>"S"ANDA$<>"C"A
NDA$<>"A"THEN830                           JG
·840 IFA$="E"THENGOSUB1780:RETURN          FN
·850 IFA$="S"THEN990                       OI
·860 IFA$="C"THENGOSUB910:GOSUB1780:RETUR
N                                          NC
·870 PRINT"[DOWN][DOWN][s D][s E][s L][s
E][s T][s E][SS][s A][s L][s L][SS][s R]
[s E][s C][s O][s R][s D][s S]![SS][s A]
[s R][s E][SS][s Y][s O][s U][SS][s S][s
 U][s R][s E]?[SS]([s Y]/[s N])"          CI
·880 GETA$:IFA$<>"Y"ANDA$<>"N"THEN880      DM
·890 IFA$="Y"THENRUN                       PH
·900 GOSUB1780:RETURN                      LF
·910 PRINT"[DOWN][DOWN][s D][s E][s L][s
E][s T][s I][s N][s G][4"."]"              JO
·920 FORI=1TON:R$(CR,I)="":NEXT:FORX=1TOE
F-1                                        JK
·930 IFR$(X,1)=""THENFORI=1TON:R$(X,I)=R$
(X+1,I):R$(X+1,I)="":NEXTI                 JI
·940 NEXTX                                 IN
·950 IFEF>1ANDEF<>CRTHENEF=EF-1            GO
·960 GOSUB1860:PRINT"[DOWN][DOWN][s @] [s
 R][s E][s C][s O][s R][s D][SS]#";CR;"[
s D][s E][s L][s E][s T][s E][s D]."       EB
·970 GOSUB1830:RETURN                      OH
·980 GOTO1070                              CE
·990 POKE198,.:PRINT"[HOME][DOWN][RVSON][
BLUE][s S][s H][s I][s F][s T]-[s E] [s
T][s O][SS][s E]XIT, [s S][s H][s I][s F
][s T]-[s D] [s T][s O] [s D]ELETE[6" "]
"                                          IK
·1000 GETA$:JY=USR(.):IFJY=.ANDA$=""THEN1
000                                        FP
·1010 IFJY=3THENCR=CR+1                    GI
·1020 IFJY=7THENCR=CR-1                    GL
·1030 IFA$="[s D]"THENGOSUB910             JB
·1040 IFA$="[s E]"THENGOSUB1780:RETURN     LM
·1050 IFCR>EFTHENCR=EF                     NK
·1060 IFCR<1THENCR=1                       EB
·1070 GOSUB1860:GOTO1000                   BH
·1080 REM VIEW RECORDS                     EB
·1090 GOSUB1810:IFEF=.THENPRINTNF$:GOSUB1
830:GOSUB1780:GOSUB1750:RETURN             AC
·1100 GOSUB1110:GOSUB1780:RETURN           AF
·1110 GOSUB1850                            LN
·1120 JY=USR(.):A=CR:IFFNJF(.)THENRETURN   CD
·1130 IFJY=3THENCR=CR+1:IFCR>EFTHENCR=EF:
GOTO1110                                   PJ
·1140 IFJY=7THENCR=CR-1:IFCR<1THENCR=1:GO
TO1110                                     JD
·1150 IFJY=1THENPRINT"[HOME][DOWN]";:GOTO
1180                                       AD
·1160 IFCR<>ATHEN1110                      LO
·1170 GOTO1120                             OD
·1180 PRINT"[HOME][3"[DOWN]"][c 8]";:FORX
=1TON:PRINTN$(X);":[BLUE]";                NI
·1190 A=L%(X):IN$=" ":GOSUB1940:PRINT"[c
8]";:IFIN$<>" "THENR$(CR,X)=MID$(IN$,2)    AG
·1200 NEXT:IFCR=EFANDR$(CR,1)<>""THENEF=C
R+1:IFEF>TLTHENEF=TL                       LG
·1210 GOTO1110                             AK
·1220 REM  SORT RECORDS                    LE
·1230 REM SHELL METZNER ALGORITHM          MH
·1240 GOSUB1810:IFEF=.THENPRINTNF$:GOSUB1
830:GOSUB1780:GOSUB1750:RETURN             BM
·1250 FORX=1TON:PRINTX;"[LEFT]. ";N$(X):N
EXT                                        DA
·1260 PRINT"[c 8][DOWN][s S]ORT BY WHICH
[s F]IELD? (1 -";N;"[LEFT]) :";:A=2:GOSU
B1930                                      HC
·1270 X=VAL(IN$):IFX<1ORX>NTHEN1260        DF
·1280 M=EF-1:PRINT:PRINT"[DOWN][DOWN][s S
]TAND BY[3"."][s S]ORTING [s F]ILE!"       ON
·1290 M=INT(M/2):IFM=.THEN1370             HI
·1300 K=(EF-1)-M:J=1                       DH
·1310 I=J                                  GD
·1320 L=I+M:IFR$(I,X)<=R$(L,X)THEN1350     EP
·1330 FORR=1TON:A$=R$(I,R):R$(I,R)=R$(L,R
):R$(L,R)=A$:NEXT                          EN
·1340 I=I-M:IFI>=1THEN1320                 HJ
·1350 J=J+1:IFJ>KTHEN1290                  MH
·1360 GOTO1310                             KH
·1370 PRINT"[DOWN][DOWN][s @] [s S][s O][
s R][s T][SS][s C][s O][s M][s P][s L][s
 E][s T][s E][s D].":GOSUB1830:GOSUB1780
:GOSUB1750:RETURN                          MF
·1380 REM SEARCH RECORDS, FIND STRING      JE
·1390 GOSUB1810:IFEF=.THENPRINTNF$:GOSUB1
830:GOSUB1780:GOSUB1750:RETURN             GJ
·1400 PRINT"[HOME][DOWN][c 8][s S]EARCH [
s S]TRING:[BLUE]";:A=23:GOSUB1930:S$=IN$   MN
·1410 FORJ=1TOEF-1:FORI=1TON:IFLEFT$(R$(J
,I),LEN(S$))=S$THENCR=J:GOSUB1110:CR=J     JE
·1420 NEXTI,J:PRINT"[c 8][DOWN][RIGHT] [s
 @] [s S]EARCH [s C]OMPLETED.";:CR=1:GOS
UB1830:GOSUB1780:RETURN                    LJ
·1430 REM HARDCOPY                         HK
·1440 GOSUB1810:IFEF=.THENPRINTNF$:GOSUB1
830:GOSUB1780:GOSUB1750:RETURN             LP
·1450 PRINT"[CLEAR][RVSON][BLUE][3"*"][3"
"][s R]ECORD [s R]ANGE FOR [s H]ARDCOPY
[4" "][3"*"] "                             DL
·1460 A$="":PRINT"[s F]ROM:";:A=3:GOSUB19
30                                         BA
·1470 F=VAL(IN$)                           HN
·1480 IFF<1ORF>EFTHEN1460                  BG
·1490 A$="":PRINT"[s T]O:";:A=3:GOSUB1930  OM
·1500 L=VAL(IN$)                           MB
·1510 IFL<1ORL>EFTHEN1490                  CN
·1520 PRINT"[CLEAR]":PRINT"[c 8][3"[DOWN]
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```
"][s @] [s P][s R][s I][s N][s T][s I][s
 N][s G] [s F][s I][s L][s E] ";FT$        EF
·1530 OPEN15,4,15:CLOSE15                  FN
·1540 IFST<>.THENPRINT"[3"[DOWN]"][s P][s
 R][s I][s N][s T][s E][s R] [s O][s F][
 s F] [s L][s I][s N][s E][4"!"]":GOSUB18
 30:GOSUB1780:RETURN                       EH
·1550 OPEN4,4,7:CMD4                       MB
·1560 FORJ=FTOL:CR=J:GOSUB1880:PRINT:NEXT NJ
·1570 PRINT#4,""                           GE
·1580 CLOSE4                               AC
·1590 PRINT"[c 8][3"[DOWN]"][s @] [s D]ON
 E.":GOSUB1780                             DP
·1600 GOSUB1750:RETURN                     HF
·1610 REM CURRENT RECORD BAR               IG
·1620 IFEF=.THENRETURN                     IG
·1630 WAITJP,16,.                          GM
·1640 IFFNJF(.)THENIN$=STR$(CR):SYSPLOT,3
 2,20:PRINT"[BLUE]";:WAITJP,16,.:GOTO1790 IJ
·1650 JY=USR(.)                            AE
·1660 IFJY=3THENCR=CR+1                    PB
·1670 IFJY=7THENCR=CR-1                    BM
·1680 IFJY=1THENCR=CR+10                   AD
·1690 IFJY=5THENCR=CR-10                   FO
·1700 IFCR<1THENCR=1                       ML
·1710 IFCR>EFTHENCR=EF                     HM
·1720 IN$=STR$(CR):SYSPLOT,32,20:PRINT"[c
 7]";:GOSUB1910                            JJ
·1730 GOTO1640                             CE
·1740 REM BELL                             HG
·1750 POKES+24,15:POKES+5,.:POKES+6,247:P
 OKES+1,50:POKES+4,17                      JB
·1760 POKES,2:FORX=.TO175:NEXT:POKES+4,16
 :RETURN                                   OB
·1770 REM SWITCH TO COMMAND SCREEN         ML
·1780 GOSUB140:SYSPLOT,23,23:PRINT"[c 5]"
 ;:IFRL%THENIN$=STR$(FNM(FRE(.))):GOSUB19
 10                                        BC
·1790 GOSUB1750:IN$=STR$(CR):SYSPLOT,32,2
 0:PRINT"[BLUE]";:GOSUB1910:RETURN         FC
·1800 REM SWITCH TO TEXT                   DE
·1810 POKEV+21,.:PRINTB$:GOSUB1750:RETURN LN
·1820 REM DELAY                            CL
·1830 FORI=.TO5000:NEXT:RETURN             MK
·1840 REM PRINT ONE RECORD                 ML
·1850 POKE780,.:POKE781,1:POKE782,.:POKE7
 83,.:SYS59903                             GG
·1860 FORI=2TO24:POKE780,.:POKE781,I:POKE
 782,.:POKE783,.:SYS59903:NEXT             GN
·1870 PRINT"[HOME][DOWN][DOWN]";           LD
·1880 PRINT"[c 8][RVSON] [s R][s E][s C][
 s O][s R][s D][SS]# ";CR;"[LEFT] IN [s F
 ][s I][s L][s E][SS]";FT$;" "             MD
·1890 FORX=1TON:PRINT"[c 8]";N$(X);": ";"
 [BLUE]";R$(CR,X):NEXT:RETURN              DO
·1900 REM OUTPUT RIGHT JUSTIFIED STRING    OI
·1910 PRINTRIGHT$("[4"0"]"+(RIGHT$(IN$,LE
 N(IN$)-1)),4):RETURN                      PO
·1920 REM SAFE BASIC INPUT                 CK
·1930 FORI=.TO39:PRINTCHR$(32);:NEXT:PRIN
 T"[UP]";:IN$=""                           JI
·1940 POKE198,.:POKE204,.                  NP
·1950 WAIT198,15:GETZ$:Z=ASC(Z$):IFZ>95AN
 D(Z<193ORZ>218)THEN1950                   IK
·1960 ZL=LEN(IN$):IFZL=ATHEN1980           IK
·1970 IFZ>31THENIN$=IN$+Z$:PRINTZ$;:GOTO1
 950                                       JH
·1980 IFZ=13ANDZLTHENPOKE204,1:PRINT" ":R
 ETURN                                     BH
·1990 IFZ=20ANDZLTHENIN$=LEFT$(IN$,ZL-1):
 PRINT" [LEFT][LEFT] [LEFT]";              HI
·2000 GOTO1950                             CD
·2010 POKE56578,PEEK(56578)OR3:POKE56576,
 PEEK(56576)AND252                         PO
·2020 POKE53272,PEEK(53272)AND15:POKE648,
 192:POKE53272,(PEEK(53272)AND240)OR12     OL
·2030 PRINTCHR$(147)CHR$(8)CHR$(14)"[c 7]
 [s P]LEASE [s S]TAND [s B]Y[4"."]"        EM
·2040 FORX=1TO33:READA:POKE680+X,A:NEXT:P
 OKE56334,PEEK(56334)AND254                MB
·2050 POKE1,PEEK(1)AND251:SYS681:POKE1,PE
 EK(1)OR4:POKE56334,PEEK(56334)OR1         DG
·2060 READA:IFA=-1THENRETURN               JJ
·2070 FORX=.TO7:READD:POKE63488+A*8+X,D:N
 EXT:GOTO2060                              LC
·2080 DATA 169,,133,251,133,253,169,208,1
 33,252,169,240,133,254,162,16             GO
·2090 DATA 160,,177,251,145,253,136,208,2
 49,230,252,230,254,202,208,240,96         IK
·2100 DATA91,250,12,248,64,127,64,64,126   HP
·2110 DATA107,169,169,33,32,32,32,32,0     HN
·2120 DATA110,254,6,10,18,34,194,66,66     OP
·2130 DATA112,224,191,129,129,255,,32,112 MC
·2140 DATA113,64,64,127,64,64,127,64,127   FL
·2150 DATA114,15,16,32,64,255,128,255,129 DN
·2160 DATA115,130,2,2,2,130,130,130,130    EC
·2170 DATA125,130,130,130,130,132,136,144
 ,224,-1                                   PF
·2180 REM SPRITE DATA                      AF
·2190 DATA0,,,,,0                          EM
·2200 DATA0,,,3,255,128                    KN
·2210 DATA2,1,,2,2,0                       OH
·2220 DATA2,4,,2,2,0                       BC
·2230 DATA2,1,,2,,128                      HG
·2240 DATA2,96,64,2,144,32                 FE
·2250 DATA3,8,16,,4,8                      GG
·2260 DATA0,2,4,,1,2                       EN
·2270 DATA0,,129,,,65                      GP
·2280 DATA0,,34,,,20                       EF
·2290 DATA0,,8,,,0                         PD
·2300 DATA0,7,255,240,7,227                JI
·2310 DATA240,7,221,224,7,221              PN
·2320 DATA240,7,221,240,7,227              HH
·2330 DATA240,7,255,240,7,247              CO
·2340 DATA240,7,247,240,7,247              JN
·2350 DATA240,7,255,240,,0                 JF
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·2360 DATA0,255,255,255,198,0          EF
·2370 DATA3,197,255,227,197,64         PC
·2380 DATA35,197,255,227,192,0         EC
·2390 DATA3,255,255,255,,0             LJ
·2400 DATA0,,128,,,64                  OG
·2410 DATA0,,36,15,255,20              LM
·2420 DATA16,3,12,32,5,124             AA
·2430 DATA64,9,,255,241,0              OJ
·2440 DATA128,17,,143,17,0             PJ
·2450 DATA128,17,,255,241,0            IG
·2460 DATA128,17,,143,17,0             DN
·2470 DATA128,17,,128,17,0             IC
·2480 DATA255,241,,128,17,0            HI
·2490 DATA128,17,,143,18,0             GM
·2500 DATA128,20,,255,248,0            KH
·2510 DATA0,,,,,0                      IP
·2520 DATA0,60,,,66,0                  HL
·2530 DATA3,255,192,4,,32              DL
·2540 DATA3,255,192,2,,64              EO
·2550 DATA2,82,64,2,82,64              HL
·2560 DATA2,82,64,2,82,64              GE
·2570 DATA2,82,64,2,82,64              HC
·2580 DATA2,82,64,2,82,64              II
·2590 DATA2,82,64,2,,64                AD
·2600 DATA3,255,192,,,0                CK
·2610 DATA0,,,,,0                      OG
·2620 DATA0,,,,,0                      PM
·2630 DATA0,,,,,255                    JF
·2640 DATA0,3,,192,4,60                GM
·2650 DATA32,8,66,16,16,153            FD
·2660 DATA8,32,189,4,16,153            OG
·2670 DATA8,8,66,16,4,60               LJ
·2680 DATA32,3,,192,,255               IK
·2690 DATA0,,,,,0                      DG
·2700 DATA0,,,,,0                      EM
·2710 DATA0,,,,,0                      HK
·2720 DATA0,255,,,8,15                 IL
·2730 DATA255,20,16,3,34,32            DP
·2740 DATA5,62,64,9,34,255             DM
·2750 DATA241,34,128,17,,143           JJ
·2760 DATA17,60,128,17,34,255          MA
·2770 DATA241,34,128,17,60,143         LG
·2780 DATA17,34,128,17,34,128          LI
·2790 DATA17,60,255,241,,128           MC
·2800 DATA17,28,128,17,34,143          LG
·2810 DATA18,32,128,20,32,255          CG
·2820 DATA248,34,,,28,255              JC
·2830 DATA0,,,,,0                      MN
·2840 DATA15,128,,1,131,255            PB
·2850 DATA2,130,1,4,130,1              HN
·2860 DATA8,,1,16,63,225               EJ
·2870 DATA32,32,63,64,32,32            OH
·2880 DATA128,,32,7,252,32             CP
·2890 DATA4,7,224,4,4,0                EB
·2900 DATA0,4,,255,132,0               GB
·2910 DATA128,252,,128,128,0           HD
·2920 DATA128,128,,128,128,0           KB
·2930 DATA255,128,,255,,0              OC
·2940 DATA0,,127,255,,64               KF
·2950 DATA1,,94,1,,64                  BE
·2960 DATA1,,95,253,,64                NN
·2970 DATA1,16,95,253,8,64             DO
·2980 DATA1,252,95,253,8,64            JA
·2990 DATA1,16,95,253,,64              AB
·3000 DATA1,,95,253,,64                IF
·3010 DATA1,,95,253,,64                MH
·3020 DATA1,,64,1,,127                 IG
·3030 DATA255,,,,,0                    PK
·3040 DATA0,255                        GE
·3050 REM ICON LOCATIONS               GN
·3060 DATA 165,160,45,80,117,80,200,80,30 DJ
·3070 DATA 80,45,162,130,160,205,160   JP
·3080 REM INTERRUPT ROUTINE            II
·3090 DATA 120,169,31,141,20,3,169,207,14
 1,21,3,169,166,141,17                 BI
·3100 DATA 3,169,207,141,18,3,88,96,173,,
 220,41,15,133,253                     IM
·3110 DATA 169,15,56,229,253,168,185,221,
 207,240,8,141,168,2,160               FI
·3120 DATA 0,32,60,207,76,163,207,173,168
 ,2,10,170,189,202,207                 HA
·3130 DATA 8,152,10,170,40,48,25,240,43,1
 73,220,207,24,125,0                   OK
·3140 DATA 208,157,,208,144,31,169,1,77,1
 6,208,141,16,208,76                   AF
·3150 DATA 120,207,189,,208,56,237,220,20
 7,157,,208,176,8,169                  JB
·3160 DATA 1,77,16,208,141,16,208,173,168
 ,2,10,170,232,189,202                 BH
·3170 DATA 207,8,152,10,170,232,40,48,15,
 240,23,173,220,207,24                 IM
·3180 DATA 125,,208,157,,208,76,162,207,1
 89,,208,56,237,220                    MK
·3190 DATA 207,157,,208,96,76,49,234,173,
 ,220,41,15,133,253                    PM
·3200 DATA 169,15,56,229,253,168,185,221,
 207,168,169,,108,5,0                  BI
·3210 DATA 32,155,183,138,72,32,155,183,1
 04,168,24,76,240,255,0                NP
·3220 DATA 0,,255,1,255,1,,1,1,,1,255,1,2
 55,0                                  BM
·3230 DATA 255,255,2,,1,5,,7,8,6,,3,2,4 FD
```

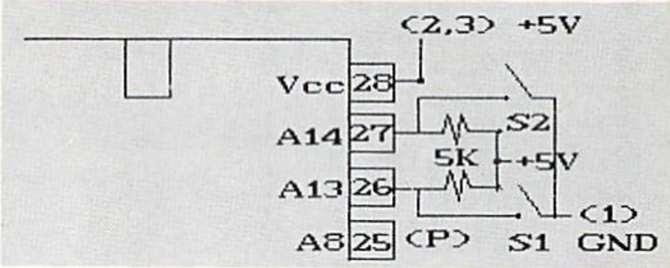


Figure 5:
Modification for Bank Switching a 27256 EPROM

S1	S2	8K Quarter
C	C	First
O	C	Second
C	O	Third
O	O	Fourth

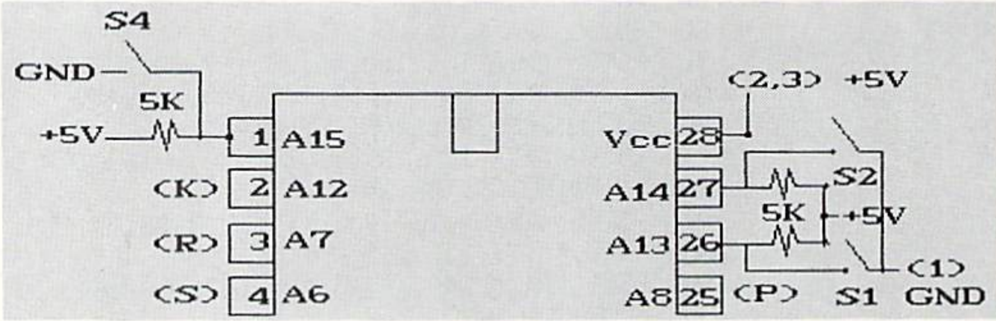


Figure 6:
Modification for Bank Switching a 27512 EPROM

S4	ROM Half
C	Bottom
O	Top

S1	S2	8K Quarter
C	C	First
O	C	Second
C	O	Third
O	O	Fourth

EXPANSION PORT, PART 2

Continued from page 62

Contacts 12 (bus available, BA) and 13 (direct memory access, DMA) are designed to function together. These allow an external device, such as the 1700 and 1764 RAM expansion modules, to halt the microprocessor and take control of the data and address buses. This permits direct access to the C-64's RAM by external devices.

Contacts 7 (I/O 1) and 10 (I/O 2) go low when the address ranges $DE00 to $DEFF (56832 to 57087) and $DF00 to $DFFF (57088 to 57343) appear on the address bus. This permits up to 512 bytes to be used by external I/O chips which can greatly expand the C-64's interfacing abilities. The PCC4 mentioned above makes use of these lines for its soft switch at $DFFF (57343) or $DEFF (57087). Contact E brings out phase 2 of the system clock which is used for timing the I/O devices. The Microtroll from Slide Mountain Systems, which we reviewed last month (see page 67, December), makes extensive use of these three I/O lines.

Finally, contact 6 brings out the dot clock. This signal pulses at a rate of approximately eight million times each second (8.18 MHz for NTSC and 7.88 for PAL systems). This allows external devices to be precisely synchronized with the computer's video display. The Turbo Processor from Swisscomp, also reviewed last month (see page 63, December), divides this signal by two to clock its 65816 microprocessor at approximately 4 MHz.

An analysis of the expansion port quickly shows why in most cases only one cartridge may be used at a time. At the very least each cartridge should have complete control of the GAME and EXROM lines. Also, ROMs mapped in the same address range will present conflicting data on the address bus. Thus the minimum requirements for an expansion chassis which supports independently controllable cartridges are the facilities for the discrete control of EXROM, GAME, ROML, and ROMH in each slot.

We have demonstrated that the complete complement of microprocessor control lines which are present on the expansion port is what makes possible the versatile cartridges we have become accustomed to. The selection of products we have been reviewing represent only a small sample of the applications for this orifice. ☐



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